Mathematics 5



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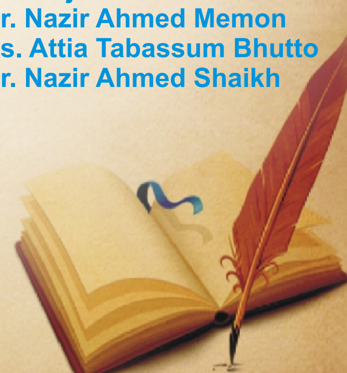
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PREFACE

The Sindh Textbook Board is an organization charged with the preparation and publication of textbooks in the province of Sindh. Its prime objective is to develop and produce textbooks which are conductive to equip the new generation with the knowledge and acumen to prepare them to face the challenges of the rapidly changing environment. In this age of knowledge explosion and development of technology not witnessed in the human history, efforts have to be made to ensure that our children do not lag behind. The Board also strives to ensure that Universal Islamic Ideology, culture and traditions are not compromised in developing the textbooks.

To accomplish this noble task, a team of educationists, experts, working teachers and friends endeavor tirelessly to develop text and improve contents, layout and design of the textbooks.

An attempt has made in this textbook to provide horizontal and vertical integration. The efforts of our experts and production personnel can bring about the desired results only if these textbooks are used effectively by teachers and students. Their suggestions will help us in further improving the qualitative contents of textbooks.

Chairman
Sindh Textbook Board

بسم الله الرحمن الرحيم

Unit 1

NUMBERS AND ARITHMETIC OPERATIONS

1.1 NUMBERS UP TO ONE BILLION

Read numbers up to one billion in numerals and in words

Concept of One Billion

We have learnt in class IV that the smallest number of nine digits is **100000000** (One hundred million)

Look at the number "34,768,172"

Millions	Thousands	Ones
34	768	172





- How many millions are in **34,768,172**
- How many thousands are in **34,768,172**
- How many ones are in **34,768,172**
- Write, **34,768,172** in words.

____

____

We know that the greatest number of nine digits is 999,999,999 read as "Nine hundred ninety nine millions, nine hundred ninety nine thousands' and nine hundred ninety nine" when we add one more to it, then

999,999,999 + 1 = 1,000,000,000

Teacher's Note

After revision of numbers in millions, teacher should help students to develop the concept of one billion by counting numbers of digits by using flash cards or other related material.

The number after **999,999,999** is **1,000,000,000**. It is read as One thousand million.

One Billion = One thousand million

According to the place value chart of numbers, there are the following four periods for representing numbers upto billions.

4th period	3rd period	2nd period	1st period
Billions ,	**Millions** ,	**Thousands** ,	**Ones**

Representation of one billion in Place Value Chart

Billions	Millions			Thousands			Ones		
B	H-M	T-M	M	H-Th	T-Th	Th	H	T	O
1	0	0	0	0	0	0	0	0	0

For reading a number, we put commas to separate the periods from right.

Example. Read the following numbers:

(i) **245612384** (ii) **1000000000**

Solution: **(i) 245612384**

We first separate the digits of numbers in periods.

2 4 5, 6 1 2 , 3 8 4

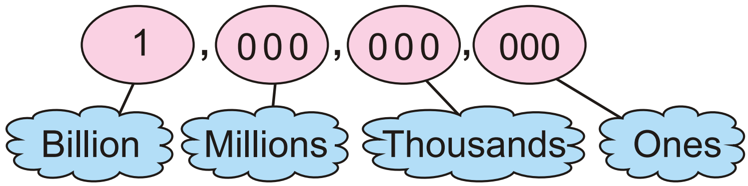
Millions	Thousands	Ones
2 4 5	6 1 2	3 8 4

We read it as "Two hundred forty five millions, six hundred twelve thousands and three hundred eighty four and write it as: 245,612,384."

Solution: **(ii) 1000000000**

We first separate the digits of numbers in periods:

1 , 000 , 000 , 000



We can read it as: "One Billion"

Write numbers up to 1,000,000,000 (one billion) in numerals and in words

Example 1. **Write 234,567,812 in words.**

Solution. We first write the digit of the numbers in place value chart.

234,567,812

Millions			Thousands			Ones		
H-M	**T-M**	**M**	**H-th**	**T-th**	**Th**	**H**	**T**	**O**
2	3	4	5	6	7	8	1	2

Hence the given number is 234,567,812 and written in words as Two hundred thirty four millions, five hundred sixty seven thousands and eight hundred twelve.

Example 2. **Write "Seven Billions Three hundred fifty six millions, two hundred sixty seven thousands and nine hundred two" in numerals.**

Solution: We first write the number in place value chart:

Billions	Millions			Thousands			Ones		
B	**H-M**	**T-M**	**M**	**H-Th**	**T-Th**	**Th**	**H**	**T**	**O**
7	3	5	6	2	6	7	9	0	2

So, the required number is **7356267902**.

Thus the given number can be written as **7,356,267,902**.

Activity **Write the digit under their correct place value and also write the number in words.**

3 thousand
6 hundred
7 ten thousand
1 million
0 ones
8 tens
2 hundred thousand

M	H-th	T-th	Th	H	T	O

So, the number in words is ______________________.

EXERCISE 1.1

A. Separate by periods and read the following numbers.

(1) 45672 (2) 2670273 (3) 34296127
(4) 100000000 (5) 9923456310 (6) 6123450238

B. Write the following numbers in words.

(1) 66,655,522 (2) 96,340,529 (3) 245,672,316
(4) 100,000,000 (5) 4,912,398,866 (6) 1,833,387,754

C. Write the following numbers in numerals.

(1) One million, two thousands and six hundreds.
(2) Nine millions, ninety nine thousands and seventy seven.
(3) Fifty eight millions, eight hundred sixty two thousands and forty five.
(4) One billion (5) Seven billions (6) Nine billions
(7) Six billion, Ninety six millions, forty nine thousands and six hundred eight.
(8) Two billion, Three hundred forty five millions, six hundred seventy one thousands and eight hundred six.

D. Write the digit under the correct place value and also write the number in words.

3 ten thousand
5 thousand
7 hundred
4 ones
2 million
5 tens
0 hundred thousand
6 billion

B	M	H-th	T-th	Th	H	T	O

So, the number in words is ______________________.

1.2 ADDITION AND SUBTRACTION

Add numbers of complexity and of arbitrary size

We have learnt to add and subtract numbers up to 6 digits. Let us revise.

We always start addition or subtraction from ones.

Example 1.

Add 638,941 and 347,036

Write numbers according to place values and then add.

Solution:

	H-Th	T-Th	Th	H	T	O
(carry)		1				
	6	3	8	9	4	1
+	3	4	7	0	3	6
	9	8	5	9	7	7

Example 2.

Add 359,990 and 406,780

Write numbers according to place values and then add.

Solution:

	H-Th	T-Th	Th	H	T	O
(carry)		1	1	1		
	3	5	9	9	9	0
+	4	0	6	7	8	0
	7	6	6	7	7	0

While adding numbers we should write the digits according to their place value and then add them accordingly.

Example 3.

Add: 5,389,624 and 930,157

Solution:

	M	H-Th	T-Th	Th	H	T	O
carry	1	1				1	
	5	3	8	9	6	2	4
+		9	3	0	1	5	7
	6	3	1	9	7	8	1



Activity

Fill the missing digits of the following.

	6	4	5	1	◯	3
+	3	◯	3	◯	1	2
	9	8	8	6	3	5

EXERCISE 1.2

A. Solve.

(1) 713492 + 268310

(2) 4318114 + 313934

(3) 8193860 + 429177

(4) 6216921 + 834538

(5) 3941234 + 590543

(6) 5491869 + 605304

(7) 7390443 + 1538006

(8) 2555312 + 1084881

(9) 5319432 + 4181518

(10) 34653635 + 2660477

(11) 56018987 + 23594431

(12) 438394568 + 351056939

B. Add.

(1) 680,563 and 563,168

(2) 3,541,371 and 232,164

(3) 54,399,188 and 6,412,508

(4) 65,943,022 and 22,913,924

(5) 840,233,419 and 65,113,846

(6) 733,050,195 and 188,439,919

C. Fill the missing digits in the following.

(1)

```
    5 3 6 2 ◯ 4
+   3 ◯ 3 ◯ 2 2
---------------
    8 8 9 6 3 6
```

(2)

```
    3 4 7 8 4 5
+   4 ◯ 2 ◯ 1 ◯
---------------
    7 6 0 1 5 9
```

(3)

```
    5 6 0 1 8 9 7
+   2 ◯ 5 ◯ 4 ◯ 1
-----------------
    8 1 5 5 3 1 8
```

(4)

```
    3 4 ◯ 5 ◯ 3 7
+   2 ◯ 4 2 0 ◯ 2
-----------------
    6 0 6 7 1 4 9
```

Subtract numbers of complexity and of arbitrary size

Example 1.

Subtract 430,912 from 871,032

Write numbers according to place values and then subtract.

Solution:

	H-Th	T-Th	Th	H	T	O
			0	10		
	8	7	~~1~~	0	3	2
–	4	3	0	9	1	2
	4	**4**	**0**	**1**	**2**	**0**

Example 2.

Subtract 273,587 from 307,843.

Write numbers according to place values and then subtract.

Solution:

	H-Th	T-Th	Th	H	T	O
		10		7	13	13
	3	~~0~~	7	~~8~~	~~4~~	~~3~~
–	2	7	3	5	8	7
	0	**3**	**4**	**2**	**5**	**6**

Numbers of more than 6-digits can be subtracted in the same way.

Example. **Subtract 6,134,248 from 8,206,884**

Solution:

	M	H-Th	T-Th	Th	H	T	O
		1	10			7	(10)
	8	~~2~~	0	6	8	~~8~~	4
–	6	1	3	4	2	4	8
	2	**0**	**7**	**2**	**6**	**3**	**6**

Explanation:

(i) Borrow 1-ten from 8 tens, add 4 ones to get 14 ones; where 7 tens are left. Now complete the process of subtraction up to thousands.

(ii) Again borrow 1 hundred-thousand from 2 hundred-thousands and add to ten-thousands to get 10 ten-thousands, where 1 hundred thousand is left. In this way complete the process of subtraction.



Activity 1

Fill the missing digits in the following.

```
  5 8 5 4 6 3
– 3 ○ 1 ○ 1 2
-------------
  2 3 4 2 5 1
```



Activity 2

Fill the missing digits in the following.

```
  7 4 ○ 8 6 ○
– 3 ○ 1 ○ 1 2
-------------
  4 4 2 4 5 3
```

EXERCISE 1.3

A. Solve:

(1) 2863132 – 164350

(2) 5634153 – 393844

(3) 4194312 – 994208

(4) 4395684 – 2348736

(5) 50862131 – 944029

(6) 65309949 – 8214309

B. Subtract.

(1) 214,379 from 600,500 (2) 856,394 from 3,767,595

(3) 4,930,109 from 5,851,036 (4) 5,396,138 from 43,547,967

(5) 35,180,962 from 89,086,371 (6) 134,258,369 from 656,148,154

C. Fill the missing digits in the following.

(1)

	8	7	3	2	4	6
–	4	3	○	○	2	○
	4	**4**	**2**	**1**	**2**	**3**

(2)

	6	9	4	7	○	4
–	3	○	3	○	2	2
	3	**8**	**1**	**6**	**3**	**2**

(3)

	5	○	3	4	○	9	8
–	3	2	○	2	3	4	○
	2	**7**	**2**	**2**	**5**	**5**	**4**

(4)

	6	8	1	4	○	3	9
–	○	○	0	2	5	2	○
	3	**4**	**1**	**2**	**2**	**1**	**5**

1.3 MULTIPLICATION AND DIVISION

Multiply numbers, up to 6-digits, by 10,100 and 1000

We have learnt in class IV to multiply numbers.
Let us revise.

Example 1. Multiply: (i) 2658 by 10 (ii) 38524 by 10 (iii) 451392 by 10

Solution:

	Th	H	T	O
	2	6	5	8
		x	1	0
	0	0	0	0
+ 2	6	5	8	x
2	**6**	**5**	**8**	**0**

	T-Th	Th	H	T	O
	3	8	5	2	4
			x	1	0
	0	0	0	0	0
+ 3	8	5	2	4	x
3	**8**	**5**	**2**	**4**	**0**

	H-Th	T-Th	Th	H	T	O
	4	5	1	3	9	2
				x	1	0
	0	0	0	0	0	0
+ 4	5	1	3	9	2	x
4	**5**	**1**	**3**	**9**	**2**	**0**

From the examples, it is clear that in the multiplication of a natural number with 10, we put a zero in the given number at right and rest of the number remains same. This rule can also be applied in the multiplication of numbers with 100 and 1000.

Example 2. Multiply

(i) 4353 by 100

Solution:

			Th	H	T	O
			4	3	5	3
			x	1	0	0
			0	0	0	0
		0	0	0	0	x
+	4	3	5	3	x	x
	4	3	5	3	0	0

(ii) 58351 by 1000

Solution:

				T-Th	Th	H	T	O
				5	8	3	5	1
				x	1	0	0	0
				0	0	0	0	0
			0	0	0	0	0	x
		0	0	0	0	0	x	x
+	5	8	3	5	1	x	x	x
	5	8	3	5	1	0	0	0

Example 3. Multiply 536847 by 10, 100 and 1000.

Solution:

H-Th	T-Th	Th	H	T	O			HM	TM	M	H-Th	T-Th	Th	H	T	O
5	3	6	8	4	7	x 10	=			5	3	6	8	4	7	0
5	3	6	8	4	7	x 100	=		5	3	6	8	4	7	0	0
5	3	6	8	4	7	x 1000	=	5	3	6	8	4	7	0	0	0

Remember: To multiply a number by 10 (100), (1000); we write one zero, (two zeroes), (three zeroes) at right of the given number. Rest of the numbers remain same.

Teacher's Note Teacher should ensure enough practice of multiplication by 10, 100 and 1000 by asking questions orally.

Multiply numbers, up to 6-digits, by a 2-digits and 3-digits numbers

Example 1. Multiply: (i) 754,863 by 40 (ii) 754,863 by 400

Solution:

(i) 7 5 4 8 6 3 x 40
= 7 5 4 8 6 3 x **4** x **10**
= (754863 x **4**) x **10**
= 3019452 x **10** = 30194520
= 30,194,520

In case of multiplication of a number with 40, we have to multiply it with 4 and 10. So, multiply the given number by 4 and put one zero in the right of the product for multiplying by 10.

(ii) 7 5 4 8 6 3 x 400
= 7 5 4 8 6 3 x **4** x **100**
= (754863 x **4**) x **100**
= 3019452 x **100** = 301945200
= 301,945,200

Similarly in case of multiplication of number with 400, we have multiplied the given number by 4 and put two zeroes in the right of the product for multiplying by 100.

Example 2. Multiply 323114 by 32

Solution:

```
          (1)
  3 2 3 1 1 4
        x 3 2
-------------
 (1)
  6 4 6 2 2 8   → Multiplication by 2 ones (1)
(1)
+9 6 9 3 4 2 x  → Multiplication by 3 tens (10)
-------------
1 0,3 3 9,6 4 8
```

Thus, 323114 x 32 = 10,339,648

Example 3. **Find the product of 230214 and 103**

Solution:

							①	
		2	3	0	2	1	4	
				x	1	0	3	
		①		①				
		6	9	0	6	4	2	
	0	0	0	0	0	0	x	
+ 2	3	0	2	1	4	x	x	
2	**3**	**7**	**1**	**2**	**0**	**4**	**2**	

Thus, 230214 x 103 = 23,712,042

EXERCISE 1.4

A. Solve.

(1) 4136 x 10
(2) 34569 x 10
(3) 21034 x 10
(4) 15347 x 100
(5) 27796 x 100
(6) 155430 x 100
(7) 41357 x 1000
(8) 386975 x 1000

B. Solve.

(1) 1942 x 50
(2) 63578 x 80
(3) 25608 x 70
(4) 326985 x 90
(5) 8540 x 300
(6) 280915 x 600

C. Multiply.

(1) 25839 x 33
(2) 243419 x 86
(3) 65204 x 75
(4) 467808 x 92
(5) 76391 x 22
(6) 298543 x 44
(7) 349776 x 53
(8) 531062 x 68
(9) 12873 x 425
(10) 859046 x 710
(11) 357904 x 486
(12) 809507 x 907
(13) 598722 x 235
(14) 914076 x 572
(15) 743158 x 377
(16) 865432 x 444

Divide numbers, up to 6-digits, by a 2-digit and 3-digit numbers

Let us consider the following examples.

Example 1. Divide 643185 by 24 and find quotient and remainder.

```
                 26799  ──────► Quotient
Divisor ◄── 24 ) 6 4 3 1 8 5 ──► Dividend
               _ 4 8
               ──────
                 1 6 3
               _ 1 4 4
               ──────
                 0 1 9 1
               _   1 6 8
               ────────
                   0 2 3 8
               _     2 1 6
               ──────────
                     0 2 2 5
               _       2 1 6
               ──────────
Remainder ◄──          0 0 9
```

Remainder should be less than the divisor

Step 1: Since digit of highest place value 6 is less then divisor 24. So, we take 64 multiply 24 by 2. Write 2 as quotient and subtract (64 – 48 = 16)

Step 2: 1 is the remainder so we get 163. Multiply 24 by 6 and get 144. Write 6 as quotient and subtract (163 – 144 = 19).

Step 3: The next digit in dividend is 1. So, we place it after 19, we get 191. Multiply 24 by 7. Write 7 as quotient and subtract (191 – 168 = 23).

Step 4: Next digit in dividend is 8, we place it after remainder 23. We get 238. Multiply 24 by 9, we get 216. Write 9 as quotient and subtract (238 – 216 = 22).

Step 5: Next digit in dividend is 5, so we put it after remainder 22 and get 225. Multiply 24 by 9, we get 216. Write 9 as quotient and subtract (225 – 216 = 9).

Hence quotient is **26,799** and remainder is **9**.

Example 2. Divide 837576 by 123

Solution:

```
         6809
123 ) 837576 (
     _738
     ─────
      0995
     _ 984
     ─────
     01176
     _1107
     ─────
        69
```

Hence quotient is **6809** and remainder is **69**.

Example: Divide 756429 by (i) 10, (ii) 100 and (iii) 1000.

Solutions:

(i)

```
         75642
    ___________
 10 ) 756429
    - 70
    -------
       56
     - 50
     ------
        64
      - 60
      -----
         42
       - 40
       ----
          29
        - 20
        ----
           9
```

(ii)

```
          7564
     ___________
 100 ) 756429
     - 700
     -------
        564
      - 500
      ------
         642
       - 600
       -----
          429
        - 400
        -----
           29
```

(iii)

```
           756
      ___________
 1000 ) 756429
      - 7000
      -------
         5642
       - 5000
       ------
          6429
        - 6000
        ------
           429
```

Explanation:

756429   10 = Quotient: **75642** and remainder is **9**.

When divide a number by 10 then the digit at ones place will be **remainder** and the number formed by the remaining digits will be the **quotient**.

756429   100 = Quotient: **7564** and remainder is **29**.

When divide a number by 100 then the number formed by the digits at ones and tens places will be the **remainder** and the number formed by the remaining digits will be the **quotient**.

756429   1000 = Quotient: **756** and remainder is **429**.

When divide a number by 1000 then the number formed by the digits at ones, tens and hundreds places will be the **remainder** and the number formed by the remaining digits will be the **quotient**.

EXERCISE 1.5

A. Divide:

(1) 295845 by 33
(2) 569551 by 89
(3) 639133 by 97
(4) 576480 by 60
(5) 269760 by 480
(6) 135095 by 205
(7) 444771 by 321
(8) 466896 by 822

B. Find the remainder and quotient of the following.

(1)	5678 10	(2)	396785 10
(3)	473405 100	(4)	843216 100
(5)	5230106 100	(6)	8256879 1000
(7)	6456782 1000	(8)	9650000 1000

Solve real life problems involving mixed operations of addition, subtraction, multiplication and division

Example 1. **Najeeb spends Rs 438900 on buying a house and Rs 358400 on buying a car. How much did he spend in all?**

Solution: This problem involves addition.

			(1)	(1)			
Amount spent on house		4	3	8,	9	0	0
Amount spent on car	+	3	5	8,	4	0	0
Total amount		**7**	**9**	**7,**	**3**	**0**	**0**

Hence Najeeb spent **Rs797,300**

Example 2. **According to census report 1998, there were 2,380,463 females and 1,511,021 males in Hyderabad. How many females are more than males?**

Solution: This problem involves subtraction.

		1	13	7	10			
Number of females		~~2~~	~~3~~	~~8~~	~~0~~	4	6	3
Number of males	−	1	5	1	1	0	2	1
Difference		**0**	**8**	**6**	**9**	**4**	**4**	**2**

Hence the difference is **869,442**.

Example 3. Faraz earns Rs 16540 in a month. How much money will he earn in 2 years?

Solution: 2 years = 24 months

		②	②	①		
Earning in a month		1	6	5	4	0
Number of months				x	2	4
		6	6	1	6	0
	+ 3	3	0	8	0	0
Total Amount	**3**	**9**	**6,**	**9**	**6**	**0**

Hence Faraz will earn **Rs 396,960**

Example 4. How many boxes will be required to pack 235704 oranges, if one box contains 56 oranges?

Solution:

Number of oranges = **235704**

Number of oranges in a box = **56**

```
       4209
56 ) 235704 (
    -224
      117
     -112
       504
      -504
         0
```

Hence **4,209** boxes will be required.

EXERCISE 1.6

(1) Fouzia had **145320** rupees. Her father gave her **54304** rupees more. How many rupees Fouzia had altogether?

(2) Sobia gave a **5000** rupee note to the shopkeeper for purchasing an electronic doll worth **Rs 2300**. Find the remaining amount received by Sobia.

(3) A school collected funds for flood relief. **225** students of a school contributed equally **Rs 23650**. Find the contribution by each student.

(4) A factory produced **235,806** floor marble tiles in a day. How many marbles will be produced in **32** days?

(5) Government spent **Rs 5,380,100** on gas supply in one town. What is the total amount spent on gas supply of **25** such towns?

(6) A container holds **9475** litres of milk. How many litres of milk will **354** such containers hold?

(7) Find the number of roll required to pack **531,675** metre cloths. One roll contains 45 metres.

(8) A construction company wanted to purchase a land for housing scheme of **Rs 52,890,500**. It had **Rs 50,456,128** and borrowed the rest from the Bank. How much money did the company borrow from the Bank?

1.4 ORDER OF OPERATIONS BODMAS RULE

Recognize BODMAS rule, using only parentheses ( ) and carry out combined operations using BODMAS rule

The rule of BODMAS is formed to help us in remembering the order of preferences of mathematical operations. The following order must be followed by solving any mathematical problem.

B	**Brackets**	Solve within brackets ( )
O	**of**	To multiply
D	**Divide**	÷
M	**Multiply**	x
A	**Add**	+
S	**Subtract**	–

Teacher's Note Teacher should show students that answer will be wrong if BODMAS rule is not followed.

Preference of solving brackets is as follows:

(i) ( ) parentheses
(ii) { } curly brackets
(iii) [ ] square brackets.

Brackets ( ) are known as parentheses.
Let us understand BODMAS rule with the following examples.

Example 1. Solve by using BODMAS rule 135   15 + 6 – 5 x 2

Solution: 135   15 + 6 – 5 x 2

= 9 + 6 – 5 x 2 (By applying DMAS rule we first perform **division**). (135   15 = 9)

= 9 + 6 – 10 Then perform **multiplication.** (5 x 2 = 10)

= 15 – 10 In the last perform **subtraction.**

= 5

Example 2. Solve by using BODMAS 64 – (6 of 2) x 3

Solution:

= 64 – (6 x 2) x 3 First perform operation **of** 6 x 2

= 64 – 12 x 3 → Then remove bracket after **Multiplication**

= 64 – 36 → and then **Subtract**

= 28

Example 3. Solve: 82 – 32 of 2 + (8 + 20   4)

Solution: 82 – 32 x 2 + (8 + 20   4) (of means multiplication)

= 82 – 64 + (8 + 20   4) (Now perform division)

= 82 – 64 + (8 + 5) (Now remove brackets)

= 82 – 64 + 13 (In the last perform addition and subtraction)

= 18 + 13

= 31



Solve by using BODMAS rule

(213 – 123) + 60 x 5 – (64   8)

= 90 + 60 x 5 – (64   8)
= 90 + 60 x 5 – 8
= 90 + 300 – 8
= 390 – 8
= 282

Now give answers of following:

Step 1: Solve ________________

Step 2: Solve ________________

Step 3: Solve ________________

EXERCISE 1.7

Solve:

(1) (9 – 8) x 18

(2) (5 x 9)   15

(3) 16   2 + 5 x 4 – 2

(4) 32 x 21 – 42   7

(5) 144   12 + 5 x 30

(6) 6 x 5 + 16   4

(7) 50 x 5 + (15 + 23)

(8) 7 + (15   3 + 5) x 4 – 20

(9) 4 of 195   13 – 54

(10) (3 x 18)   3 of 2 + 105

(11) 5 x (15 – 10) – 20 of 3   4

(12) (20 + 5 of 12)   8 – 3 x 3

(13) (28   4 + 5) x 4 – 11 of 3

(14) 5 + (42 + 7 of 2 – 2) x 8

(15) 100 of (3 x 150   10)

(16) 60 + (72   7 of 3 + 5) x 2

Verify distributive laws

There are two types of distributive laws:

(i) Distributive law of multiplication over addition with respect to multiplication.

(ii) Distributive law of multiplication over subtraction with respect to multiplication.

According to distributive law, addition or subtraction of any two numbers within brackets and its multiplication by the number outside the bracket gives the same result of the multiplication of the outer number with both the numbers and addition or subtraction of the results. Let us understand the process of verification of distributive laws with the help of examples.

Example 1. Verify distributive laws.

(i) 8 x (3 + 2) = (8 x 3) + (8 x 2)

(ii) (12 – 10) x 4 = (12 x 4) – (10 x 4)

Solution: (i) 8 x (3 + 2) = (8 x 3) + (8 x 2)

LHS	RHS
LHS = 8 x (3 + 2)	RHS = (8 x 3) + (8 x 2)
= 8 x 5	= 24 + 16
= 40	= 40

LHS = RHS
Hence verified

(ii) (12 – 10) x 4 = (12 x 4) – (10 x 4)

LHS	RHS
LHS = (12 – 10) x 4	RHS = (12 x 4) – (10 x 4)
= 2 x 4	= 48 – 40
= 8	= 8

LHS = RHS
Hence verified

Example 2. Fill in the blanks.

(1) 18 x (6 + 3) = (18 x ☐) + (18 x ☐)

(2) (☐ + ☐) x 5 = (20 x ☐) + (10 x ☐)

(3) 2 x (5 – ☐) = (2 x ☐) – (☐ x 7)

Solution:

(1) 18 x (6 + 3) = (18 x [6]) + (18 x [3])

(2) ([20] + [10]) x 5 = (20 x [5]) + (10 x [5])

(3) 2 x (5 – [7]) = (2 x [5]) – ([2] x 7)

EXERCISE 1.8

A. Verify distributive laws.

(1) 5 x (3 + 2) = (5 x 3) + (5 x 2)
(2) 4 x (9 – 5) = (4 x 9) – (4 x 5)
(3) (18 + 2) x 10 = (18 x 10) + (2 x 10)
(4) 10 x (12 – 3) = (10 x 12) – (10 x 3)
(5) (4 + 5) x 7 = (4 x 7) + (5 x 7)
(6) (9 – 6) x 8 = (9 x 8) – (6 x 8)

B. Fill in the blanks.

(1) 15 x (5 + 3) = (15 x ☐) + (15 x ☐)

(2) (25 – 18) x 32 = (25 x ☐) – (18 x ☐)

(3) (☐ + ☐) x 10 = (30 x 10) + (40 x 10)

(4) (3 ☐ 5) x 14 = (3 ☐ 14) + (5 x 14)

(5) ☐ x (26 + 74) = (5 x 26) ☐ (5 x 74)

(6) 9 x (13 – ☐) = (9 x ☐) – (9 x 5)

REVIEW EXERCISE 1

1. Write the following numbers in words:

(i) 246,416,279 (ii) 905,407,608

2. Write the following numbers in numerals:

(i) Seventy five million, twenty six thousand four hundred twenty.

(ii) Four hundred five million, seven hundred forty five thousand eight hundred six.

3. Add the following:

(i) 205, 617,291 and 5,412,306

(ii) 4,000,405 and 20136,999

(iii) 214,308,196 and 523,410,018

4. Subtract the following:

(i) 412,326,917 from 624,005,123

(ii) 96,105,892 from 712,342,445

(iii) 234,596,501 from 641,884,962

5. Solve:

(i) 1,243 x 10 (ii) 962,345 x 45 (iii) 56,729 x 40

(iv) 612,378 x 962 (ii) 405,617 x 1000

6. Divide:

(i) 753400 by 30 (ii) 269817 by 356

7. Solve:

(i) 180   10 x (50 of 2   4) (ii) 48 – (5 of 2 + 12)

8. Verify:

(i) 2 x (4 + 7) = (2 x 4) + (2 x 7)

(ii) 5 x (96 – 34) = (5 x 96) – (5 x 34)

9. A water tanker holds **24541** litres of water. How much will be in **35** such tankers?

10. A box contains **30** chalks. How many such boxes are required to pack **24660** chalks?

Unit 2 HCF AND LCM

(Highest Common Factor and Least Common Multiple)

2.1 HCF

Find HCF of three numbers, up to 2-digits

In the previous class, we learned about HCF by using Venn diagram, prime factorization method, LCM by using common multiples and prime factorization. Now we will learn HCF and LCM in more detail.

HCF means Highest Common Factor. It is of two or more natural numbers. It is the greatest common factor (divisor) of the given natural numbers. HCF is also called Greatest Common Divisor (GCD).

Now we find HCF by using

(1) Prime Factorization method

(2) Division method

1. Prime Factorization method

Procedure:

(i) Write prime factors of all the given numbers.

(ii) Find common factors from all the prime factors.

(iii) Write the product of all common factors.

(iv) The product of common factors is the required HCF.

Consider the following examples:

Example 1.

Find HCF of **40** and **50** by using prime factors method.

Solution:

Prime factors of 40 = 2 x 2 x 2 x 5

Prime factors of 50 = 2 x 5 x 5

2	40
2	20
2	10
5	5
	1

2	50
5	25
5	5
	1

Common factors of both prime factors are 2 and 5

Product of common factors = 2 x 5 = 10

So, HCF of **40** and **50** is **10**.

Example 2. Find HCF of **18**, **30** and **36**.

Solution:

Prime factors of 18 = 2 x 3 x 3

Prime factors of 30 = 2 x 3 x 5

Prime factors of 36 = 2 x 2 x 3 x 3

2	18
3	9
3	3
	1

2	30
3	15
5	5
	1

2	36
2	18
3	9
3	3
	1

Common factors of all the prime factors are 2 and 3.

Product of common factors = 2 x 3 = 6

So, HCF of **18**, **30** and **36** is **6**.

2. By Division Method

We have learnt to find the HCF by prime factors method.

Now we will learn to find HCF of two numbers by division method.

Let us consider the following examples.

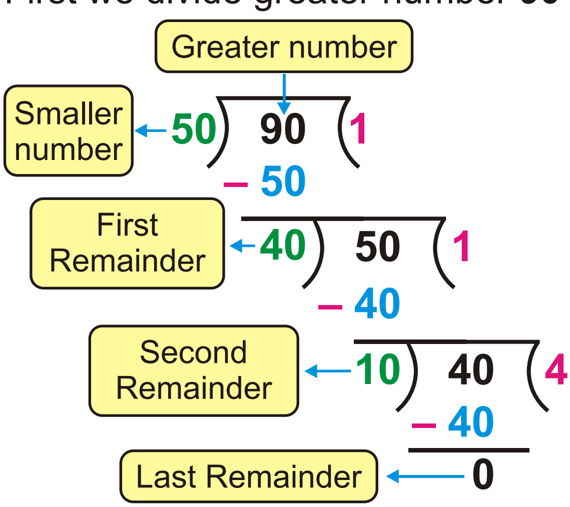
Example 1: Find HCF of **50** and **90** by division method.

Solution:

Given two numbers are **50** and **90**.

Larger number is **90** and smaller number is **50**.

First we divide greater number **90** by smaller number **50**.



Step 1: **90**   **50 = 1**,
remainder **40**
First remainder is **40**.

Step 2: Again we divide **50** by **40**.
We get **50**   **40 = 1**,
remainder **10**

Step 3: Lastly **40**   **10 = 4**,
remainder **0**

Hence, HCF of **50** and **90** = **10**

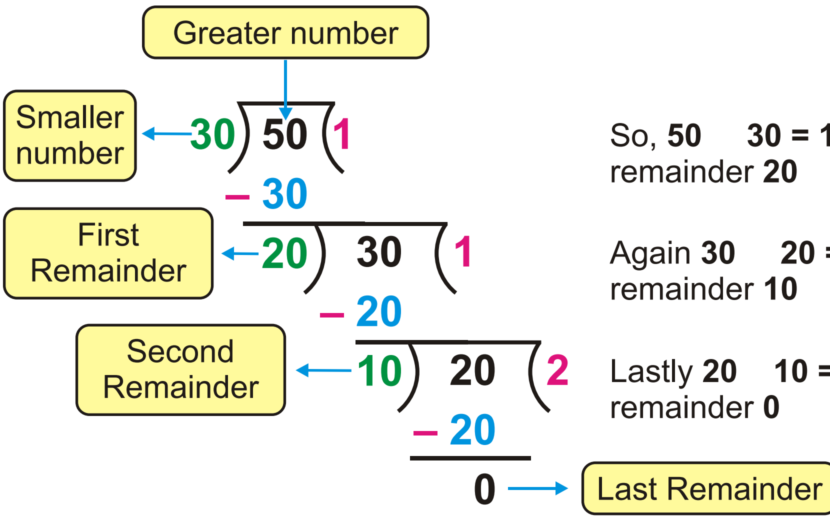
Teacher's Note Teacher should revise the methods of finding HCF learnt in previous class. Teacher should also help to understand the procedure of prime factorization method.

Example 2. Find HCF of **30**, **50** and **80**.

Solution:

First find HCF of any two given numbers; say **30** and **50**.

(i) Divide greater number **50** by smaller number **30**.



Hence, HCF of **30** and **50** = **10**

Now we have to find HCF of **10** and the remaining number **80** by division method.

Divide the greater number **80** by smaller number **10**.



80 is exactly divided by **10**.

80   **10 = 8**, remainder **0**.

So, **10** is HCF of **10** and **80**.

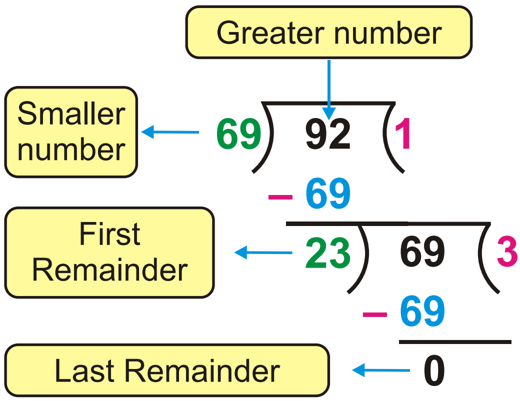
Hence, HCF of **30**, **50** and **80** = **10**

Example 3. Find HCF of **46**, **69** and **92**.

Solution:

(i) Find HCF of any two given numbers, say **69** and **92**.

(ii) Divide greater number **92** by smaller number **69**.



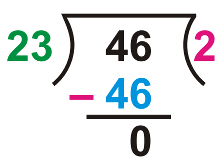
92 **69 = 1**, remainder **23**

69 **23 = 3**, remainder **0**

So, HCF of **69** and **92** = **23**

Again find HCF of **23** and the third number **46** by division method.

Divide the greater number **46** by smaller number **23**.



46 is exactly divided by **23**

46 **23 = 2**, remainder **0**.

So, HCF of **46** and **23** = **23**

Hence, **23** is HCF of **46**, **69** and **92**.

EXERCISE 2.1

A. Find HCF of the following by Prime Factorization method.

(1) 16 and 28	(2) 27 and 36	(3) 24 and 56
(4) 28 and 42	(5) 44 and 66	(6) 52 and 78
(7) 20, 60 and 80	(8) 32, 48 and 96	(9) 35, 49 and 63
(10) 26, 39 and 65	(11) 45, 75 and 90	(12) 21, 35 and 63

B. Find HCF of the following by using division method.

(1) 28 and 70	(2) 66 and 88	(3) 57 and 95
(4) 51 and 85	(5) 48 and 80	(6) 54 and 90
(7) 40, 60 and 80	(8) 36, 60 and 96	(9) 32, 48 and 80
(10) 60, 75 and 90	(11) 42, 70 and 84	(12) 63, 72 and 81

2.2 LCM

Find LCM of four numbers up to 2-digits.

LCM means Least Common Multiple. Least Common Multiple is of two or more natural numbers.

LCM is the smallest natural number which is a multiple of the given numbers.

There are two methods to find the LCM of two or more numbers.

(a) Prime factorization method
(b) Division method

(a) LCM by using prime factorization method.

Steps:

- Write all prime factors of each number.
- Write all common and uncommon factors out of these prime factors.
- The product of all common and uncommon factors is the required LCM of the given numbers.

Example 1.

Find LCM of **32** and **40** by Prime Factorization method.

Solution: Given two numbers are 32 and 40

Prime factorization of 32 = 2 x 2 x 2 x 2 x 2
Prime factorization of 40 = 2 x 2 x 2 x 5
Common factors of both prime factorizations are 2, 2, 2
Uncommon factors of both prime factorizations are 2, 2, 5.
Product of common factors = 2 x 2 x 2 = 8
Product of uncommon factors = 2 x 2 x 5 = 20
LCM is product of common and uncommon factors = 8 x 20 = 160
So, the required LCM is 160.

2	32
2	16
2	8
2	4
2	2
	1

2	40
2	20
2	10
5	5
	1

Teacher's Note Teacher should revise the methods of LCM with concept. And help the students to understand the procedure of prime factorization of four numbers.

Example 2.

Find LCM of **18**, **24**, **36** and **60**.

Solution:

2	18
3	9
3	3
	1

2	24
2	12
2	6
3	3
	1

2	36
2	18
3	9
3	3
	1

2	60
2	30
3	15
5	5
	1

Prime factors of 18 = 2 x 3 x 3

Prime factors of 24 = 2 x 2 x 2 x 3

Prime factors of 36 = 2 x 2 x 3 x 3

Prime factors of 60 = 2 x 2 x 3 x 5

Common factors of all prime factors are 2, 3

Common factors of in 2 or 3 prime factors are 2, 2, 3, 5

LCM is product of all these factors

= (2 x 3) x (2 x 2 x 3 x 5) = (6) x (60) = 360

So, the required LCM is **360**.

(b) LCM by using division method

We have learnt to find the LCM by prime factorization method. Now we will learn to find LCM of four numbers by division method. Let us consider the following examples.

Example 1: Find LCM of **16** and **20** by division method.

Solution:

2	16, 20
2	8, 10
2	4, 5
2	2, 5
5	1, 5
	1, 1

LCM = 2 x 2 x 2 x 2 x 5 = **80**

Therefore LCM of **16** and **20** = **80**

Steps:

(i) Write the numbers as shown above.

(ii) Divide both numbers by a number which exactly divides at least one of the number.

(iii) Write the quotient in each case below the number.

(iv) If a number cannot be divided exactly, write the number as it is in the next row.

(v) Keep on dividing until the last row has only 1 under each number.

(vi) Product of all divisors gives the LCM.

Example 2. Find the LCM of **12**, **36** and **60** by division method.

Solution:

2	12, 36, 60
2	6, 18, 30
3	3, 9, 15
3	1, 3, 5
5	1, 1, 5
	1, 1, 1

Thus, LCM = 2 x 2 x 3 x 3 x 5 = **180**

Example 3: Find LCM of **50**, **60**, **75** and **90** by division method.

Solution:

2	50, 60, 75, 90
2	25, 30, 75, 45
3	25, 15, 75, 45
3	25, 5, 25, 15
5	25, 5, 25, 5
5	5, 1, 5, 1
	1, 1, 1, 1

LCM = 2 x 2 x 3 x 3 x 5 x 5 = **900**
Hence the required LCM of the given numbers is **900**.

EXERCISE 2.2

A. Find LCM of the following by Prime factorization method.

(1) 36 and 54 (2) 33 and 55 (3) 52 and 78
(4) 16, 24 and 40 (5) 27, 48 and 72 (6) 50, 80 and 90
(7) 56, 84 and 98 (8) 44, 66 and 99 (9) 25, 50 and 75
(10) 15, 25, 30 and 45 (11) 10, 20, 32 and 40 (12) 12, 24, 48 and 54

B. Find LCM of the following by division method.

(1) 16 and 24 (2) 20 and 25 (3) 36 and 48
(4) 27, 36 and 45 (5) 28, 35 and 63 (6) 48, 64 and 96
(7) 54, 72 and 90 (8) 55, 88 and 99 (9) 60, 70 and 80
(10) 8, 12, 32 and 48 (11) 18, 27, 36 and 45 (12) 20, 40, 60 and 80

Solve the real life problems involving HCF and LCM.

Let us consider the following examples:

Example 1. Find the least number of toffees which can be equally distributed among 15, 30 or 60 friends.

Solution: For equal distribution of least number of toffees, we have to find the LCM of 15, 30 or 60.

2	15, 30, 60
2	15, 15, 30
3	15, 15, 15
5	5, 5, 5
	1, 1, 1

So, LCM = 3 x 5 x 2 x 2 = **60**

Thus, the required number of toffees are **60**.

Example 2: Four containers have 32, 40, 56 and 72 litres capacity. Find the capacity of the largest utensil by which these containers can be filled exactly.

Solution:

2	32, 40, 56, 72
2	16, 20, 28, 36
2	8, 10, 14, 18
	4, 5, 7, 9

Highest Common Factor (HCF) = 2 x 2 x 2 = **8**

Therefore each container will be filled **8** litres.

EXERCISE 2.3

1. The lowest number, which is divisible by **15**, **25**, **40** and **75**.
2. Find the greatest number that will divide **42**, **66** and **78**.

3. Salam exercises after every **10** days and Nadeem every **6** days. Salam and Nadeem both exercised today. After how many days will they be unite and exercise together again?

4. Hooria is thinking of a number that is divisible by both **15** and **21**. What is the smallest possible number that Hooria could be thinking of?

5. Four vans leave Sukkur at the same time. The first van is seen after 3 hours, the second after 4 hours, the third after 5 hours and the fourth after 6 hours. After how many hour from the starting time, will all of them come together.

6. Boxes that are **12** cm tall are being stacked next to boxes that are **18** cm tall. What is the shortest height at which the two stacks will be of the same height?

7. Samina has two peices of cloth. One piece is **64** cm wide and the other piece is **80** cm wide. She wants to cut both pieces into strips of equal width that are as wide as possible. How wide should she cut the strips?

8. Three milk container hold 30 litres, 40 litres and 50 litres respectively. Find the capacity of a measuring utensils which can hold the milk in each container an exact number of times.

9. Find the greatest length of a measure of stick which can be used to measure exactly **30 cm**, **60 cm** or **90 cm**.

10. Pencils are in packages of **10**. Erasers are in packages of **12**. A shopkeeper wants to purchase the smallest number of pencils and erasers so that he will have exactly **1** eraser per pencil. How many packages of pencils and erasers should shopkeeper buy?

REVIEW EXERCISE 2

1. **Tick (✓) the correct answer.**

(i) **HCF of 2, 4, 10 is:**

(a) 2 (b) 4 (c) 10 (d) 1

(ii) **LCM of 3, 6, 9 is:**

(a) 3 (b) 6 (c) 9 (d) 18

(iii) **HCF of 3, 5, 7 is:**

(a) 3 (b) 1 (c) 7 (d) 5

(iv) **LCM of 2, 3 and 5 is:**

(a) 6 (b) 10 (c) 30 (d) 15

(v) To find HCF by division method we divide greater number by ________________.

(a) same number (b) twice the number

(c) smaller number (d) greater number

2. Find the least number which is exactly divisible by **6**, **8** and **12**.

3. Find the greatest number which divides **12** and **18** exactly.

4. What is the least number of apples which can be distribute equally among **10**, **15** or **20** children.

5. Two piece of cloth **15** metres and **20** metres long are to be cut into small pieces of equal lengths. What will be the greatest length of each piece?

6. What will be capacity of smallest drum which can be filled completely using each of the utensils that can fill exactly **15**ℓ, **25**ℓ, **40**ℓ or **75**ℓ.

FRACTIONS

3.1 ADDITION AND SUBTRACTION

Add and subtract two and more fractions with different denominators.

(a) Addition of fractions

We have learnt in previous class about the addition and subtraction of two fractions. When we add two fractions with different denominators, first we will make the denominators equal to each other by finding the equivalent fractions.

Let us see the following examples:

Example 1. Add $\frac{2}{5}$ and $\frac{1}{4}$

Method 1. By making equivalent fractions

Solution: $\frac{2}{5} + \frac{1}{4}$

First we find the equivalent fractions of $\frac{2}{5}$ and $\frac{1}{4}$

Finding equal multiples of 5 and 4.

So, $\frac{2}{5} = \frac{2 \times 4}{5 \times 4} = \frac{8}{20}$ and $\frac{1}{4} = \frac{1 \times 5}{4 \times 5} = \frac{5}{20}$

Now, we have a common denominator of both the fractions.

So, $\frac{2}{5} + \frac{1}{4} = \frac{8}{20} + \frac{5}{20} = \frac{8+5}{20} = \frac{13}{20}$

Sum of fractions = Sum of their equivalent fractions

Teacher's Note Teacher should revise addition and subtraction of two fractions with different denominators and learn them with more fractions also.

Method 2. By finding LCM of denominators

$$\frac{2}{5} + \frac{1}{4}$$

Find LCM of the denominators

2	5, 4
2	5, 2
5	5, 1
	1, 1

LCM = 2 x 2 x 5 = **20**

20 5 = **4**, 20 4 = **5**

$$\frac{2}{5} + \frac{1}{4} = \frac{(2 \times 4) + (1 \times 5)}{20}$$

$$= \frac{8 + 5}{20}$$

$$= \frac{13}{20}$$

So, dividing LCM 20 by denominator of $\frac{2}{5}$, 20 5 = 4

Dividing 20 by denominator of $\frac{1}{4}$, 20 4 = 5

Example 1. Solve: $\frac{1}{4} + \frac{1}{6} + \frac{3}{8}$

Solution: $\frac{1}{4} + \frac{1}{6} + \frac{3}{8}$

First find LCM of the denominators.

The LCM of 4, 6, 8 is 24

2	4, 6, 8
2	2, 3, 4
2	1, 3, 2
3	1, 3, 1
	1, 1, 1

LCM = 2 x 2 x 2 x 3 = **24**

24 4 = **6**
24 6 = **4**
24 8 = **3**

$$\frac{1}{4} + \frac{1}{6} + \frac{3}{8} = \frac{(1 \times 6) + (1 \times 4) + (3 \times 3)}{24}$$

$$= \frac{6 + 4 + 9}{24}$$

$$= \frac{19}{24}$$

So, dividing LCM 24 by denominator of $\frac{1}{4}$, 24 4 = 6

Dividing 24 by denominator of $\frac{1}{6}$, 24 6 = 4

Dividing 24 by denominator of $\frac{1}{8}$, 24 8 = 3

Hence, $\frac{1}{4} + \frac{1}{6} + \frac{3}{8}$

$$= \frac{19}{24}$$

(b) Subtraction of two fractions.

Example 1: Subtract $\frac{2}{7}$ from $\frac{1}{3}$

Solution: To subtract $\frac{2}{7}$ from $\frac{1}{3}$ means to solve $\frac{1}{3} - \frac{2}{7}$

Method 1. By making equivalent fractions:

First we find the equivalent fractions of $\frac{1}{3}$ and $\frac{2}{7}$

$$\frac{1}{3} = \frac{1}{3} \text{ x } \frac{7}{7} = \frac{1 \text{ x } 7}{3 \text{ x } 7} = \frac{7}{21}$$

and $$\frac{2}{7} = \frac{2}{7} \text{ x } \frac{3}{3} = \frac{2 \text{ x } 3}{7 \text{ x } 3} = \frac{6}{21}$$

Now we have a common denominator of both the fractions.

So, $$\frac{1}{3} - \frac{2}{7} = \frac{7}{21} - \frac{6}{21}$$

$$= \frac{7-6}{21} = \frac{1}{21}$$

> Difference of two fractions = Difference of their equivalent fractions.

Method 2. Finding LCM of denominators:

Solution: First find LCM of the denominators 3 and 7.

3	3, 7
7	1, 7
	1, 1

LCM = 3 x 7 = **21**

Now,

$$\frac{1}{3} - \frac{2}{7} = \frac{(1 \text{ x } 7) - (2 \text{ x } 3)}{21}$$

$$= \frac{7-6}{21}$$

$$= \frac{1}{21}$$

Thus, $\frac{1}{3} - \frac{2}{7} = \frac{1}{21}$

So, divide 21 by denominator of $\frac{1}{3}$, 21   3 = 7

Divide 21 by denominator of $\frac{2}{7}$, 21   7 = 3

Example 2. **Solve:** $\frac{14}{5} - 2\frac{3}{4}$

Solution:

First we change the mixed fraction into an improper fraction.

Now, $\frac{14}{5} - 2\frac{3}{4}$

$= \frac{14}{5} - \frac{11}{4}$

Then find the LCM

2	5, 4
2	5, 2
5	5, 1
	1, 1

LCM = 2 x 2 x 5 = 20

$$\frac{14}{5} - 2\frac{3}{4} = \frac{(14 \times 4) - (11 \times 5)}{20}$$

$$= \frac{56 - 55}{20} = \frac{1}{20}$$

Thus, $\frac{14}{5} - 2\frac{3}{4} = \frac{1}{20}$

Example 3. **Solve:** $\frac{4}{3} + \frac{1}{2} - \frac{1}{8}$

Solution:

$$\frac{4}{3} + \frac{3}{2} - \frac{1}{8}$$

We find the LCM of 2, 3 and 8

2	3, 2, 8
2	3, 1, 4
2	3, 1, 2
3	3, 1, 1
	1, 1, 1

LCM = 2 x 2 x 2 x 3 = 24

Therefore,

$$= \frac{(4 \times 8) + (3 \times 12) - (1 \times 3)}{24}$$

$$= \frac{32 + 36 - 3}{24}$$

$$= \frac{68 - 3}{24} = \frac{65}{3} = 21\frac{2}{3}$$

Thus, $\frac{4}{3} + \frac{3}{2} - \frac{1}{8} = 21\frac{2}{3}$

EXERCISE 3.1

A. Add the following:

(1) $\frac{1}{3} + \frac{1}{2}$ (2) $\frac{3}{4} + \frac{1}{8}$ (3) $\frac{2}{5} + \frac{1}{3}$

(4) $\frac{3}{8} + \frac{1}{3}$ (5) $\frac{2}{9} + \frac{3}{4}$ (6) $\frac{2}{5} + \frac{3}{7}$

B. Solve:

(1) $\frac{1}{3} + \frac{1}{5} + \frac{1}{9}$ (2) $\frac{1}{6} + \frac{1}{15} + \frac{1}{18}$ (3) $\frac{1}{8} + \frac{1}{12} + \frac{1}{16}$

(4) $1\frac{1}{10} + 1\frac{1}{5} + \frac{2}{20}$ (5) $2\frac{1}{3} + 1\frac{1}{15} + 1\frac{1}{20}$ (6) $1\frac{1}{24} + \frac{1}{32} + 1\frac{1}{4}$

C. Subtract the following:

(1) $\frac{3}{4} - \frac{3}{8}$ (2) $\frac{2}{3} - \frac{1}{4}$ (3) $\frac{3}{4} - \frac{1}{2}$

(4) $\frac{5}{6} - \frac{1}{2}$ (5) $4\frac{2}{5} - 1\frac{1}{4}$ (6) $3\frac{3}{5} - 2\frac{9}{10}$

D. Solve:

(1) $\frac{7}{8} - \frac{1}{3} - \frac{1}{4}$ (1) $\frac{3}{4} - \frac{1}{6} - \frac{1}{3}$ (3) $\frac{6}{7} - \frac{1}{14} - \frac{1}{2}$

(4) $2\frac{5}{6} - 2\frac{1}{3} - \frac{1}{4}$ (5) $2\frac{11}{12} - 2\frac{1}{6} - 1\frac{1}{4}$ (6) $2\frac{9}{10} - 3\frac{1}{2} - 2\frac{1}{5}$

(7) $4\frac{8}{9} - 3\frac{1}{6} - 4\frac{1}{3}$ (8) $3\frac{1}{12} - 3\frac{1}{4} - 2\frac{1}{6}$ (9) $2\frac{3}{15} - 1\frac{2}{5} - 1\frac{3}{10}$

E. Add:

(1) $\frac{2}{5}$ and $\frac{3}{10}$ (2) $\frac{1}{3}$ and $\frac{1}{6}$ (3) $\frac{1}{7}$, $\frac{1}{14}$ and $\frac{1}{21}$

F. Subtract:

(1) $\frac{2}{3}$ from $\frac{3}{4}$ (2) $\frac{1}{3}$ from $\frac{4}{5}$ (3) $\frac{3}{4}$ from $\frac{4}{5}$

3.2 MULTIPLICATION

Multiply a fraction by a number and demonstrate with the help of diagram

Let us see the following example:

Example 1. **Multiply $\frac{2}{3}$ by 3 using diagram.**

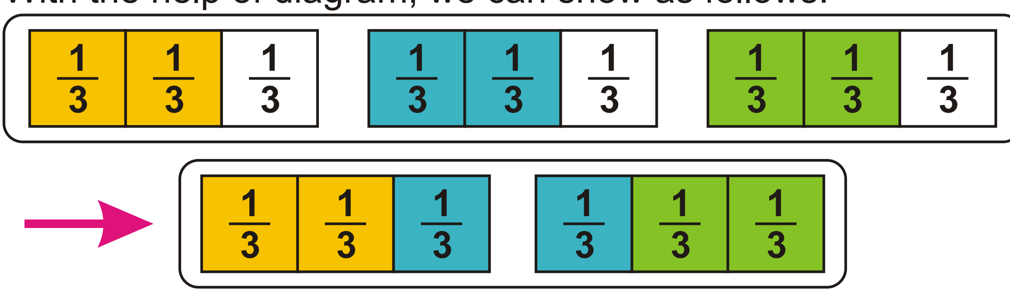
Solution:

As we know that multiply $\frac{2}{3}$ by 3 is expressed in symbol as $\frac{2}{3} \times 3$

We can express the multiplication as a repeated addition.

$$\frac{2}{3} \times 3 = 3 \times \frac{2}{3} = \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{2+2+2}{3} = \frac{6}{3}$$

With the help of diagram, we can show as follows:

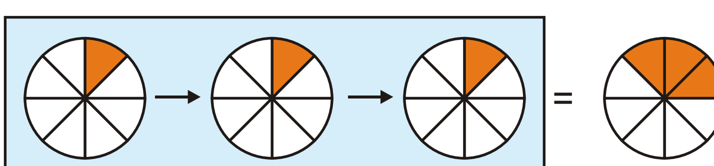


The coloured parts are $\frac{6}{3}$ or 2 whole.



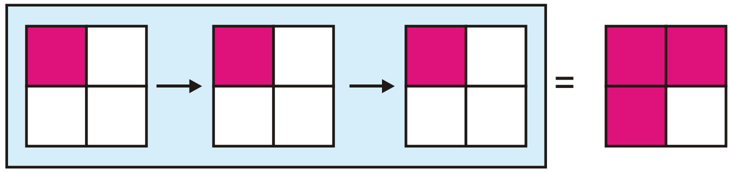
Use the diagrams to solve the following:

(1) $\frac{1}{8} \times 3$



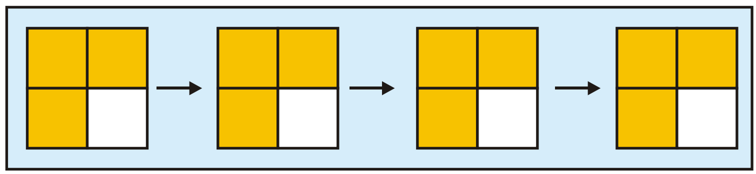
So, $\frac{1}{8} \times 3 = \boxed{\frac{1}{8}} + \boxed{\frac{1}{8}} + \boxed{\frac{1}{8}} = \boxed{\frac{3}{8}}$

(2) $\frac{1}{4} \times 3$

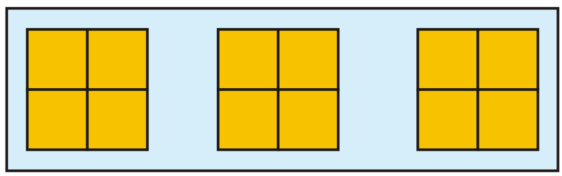


So, $\frac{1}{4} \times 3 = \square + \square + \square = \square$

(3) $\frac{3}{4} \times 4$



=



So, $\frac{3}{4} \times 4 = \square = \square = \square = \square = \square$

To multiply a fraction by a whole number means to multiply numerator by the whole number and keep the denominator same.

Multiply a fraction by another fraction

Consider the following examples:

Example 1. **Multiply $\frac{1}{2}$ by $\frac{4}{5}$.**

Solution:

We know that, $\frac{1}{2}$ by $\frac{4}{5}$ means $\frac{1}{2} \times \frac{4}{5}$

So, $\frac{1}{2} \times \frac{4}{5}$

$= \frac{1 \times \cancel{4}^{2}}{\cancel{2}_{1} \times 5} = \frac{2}{5}$

To multiply one fraction by another fraction, we multiply the numerator with numerator and the denominator with denominator. We can simplify a product by cancelling the common factors.

Example 2. **Multiply $\frac{1}{7}$ by $\frac{5}{6}$.**

Solution: $\frac{1}{7}$ by $\frac{5}{6}$ means $\frac{1}{7} \times \frac{5}{6}$

$$\frac{1}{7} \times \frac{5}{6} = \frac{1 \times 5}{7 \times 6} = \frac{5}{42}$$

Example 3. **Simplify.**

(a) $2\frac{2}{3} \times \frac{9}{4}$

Solution:

$$2\frac{2}{3} \times \frac{9}{4} = \frac{8}{3} \times \frac{9}{4}$$

$$= \frac{\cancel{8}^{2} \times \cancel{9}^{3}}{\cancel{3}_{1} \times \cancel{4}_{1}}$$

$$= \frac{2 \times 3}{1 \times 1}$$

$$= \frac{6}{1} = 6$$

(b) $\frac{6}{5} \times \frac{25}{8} \times \frac{1}{3}$

Solution:

$$\frac{6}{5} \times \frac{25}{8} \times \frac{1}{3}$$

$$= \frac{\cancel{6}^{\cancel{2}^{1}} \times \cancel{25}^{5} \times 1}{\cancel{5}_{1} \times \cancel{8}_{4} \times \cancel{3}_{1}}$$

$$= \frac{1 \times 5 \times 1}{1 \times 4 \times 1}$$

$$= \frac{5}{4} = 1\frac{1}{4}$$

EXERCISE 3.2

A. Multiply the fraction by the given whole number. Also demonstrate with the help of diagram.

(1) $\frac{3}{4} \times 4$ (2) $\frac{1}{3} \times 3$ (3) $\frac{3}{5} \times 5$

(4) $\frac{1}{2} \times 2$ (5) $\frac{1}{4} \times 8$ (6) $\frac{1}{3} \times 6$

(7) $\frac{3}{2} \times 4$ (8) $\frac{2}{3} \times 6$ (9) $\frac{3}{5} \times 11$

B. Multiply the given fraction by another fraction.

(1) $\frac{1}{2}$ by $\frac{1}{5}$ (2) $\frac{1}{4}$ by $\frac{3}{5}$ (3) $\frac{1}{3}$ by $\frac{2}{3}$

(4) $1\frac{1}{4}$ by $\frac{3}{4}$ (5) $2\frac{1}{3}$ by $\frac{4}{5}$ (6) $3\frac{1}{2}$ by $1\frac{1}{2}$

C. Simplify.

(1) $\frac{3}{4} \times \frac{8}{9}$ (2) $\frac{2}{5} \times \frac{25}{4}$ (3) $\frac{7}{3} \times \frac{9}{14}$

(4) $1\frac{5}{18} \times 2\frac{1}{10} \times \frac{8}{7}$ (5) $1\frac{6}{7} \times \frac{14}{15} \times 3\frac{1}{8}$ (6) $2\frac{1}{3} \times 1\frac{2}{3} \times \frac{20}{7}$

Multiply two or more fractions involving brackets (proper, improper and mixed fractions)

Let us see the following examples:

Example 1. **Multiply $\frac{6}{8}$ by $\frac{19}{6}$.**

Solution: $\frac{6}{8} \times \frac{19}{6} = \frac{\cancel{6}^{1} \times 19}{8 \times \cancel{6}_{1}} = \frac{19}{8} = 2\frac{3}{8}$

Example 2. **Solve:** $1\frac{1}{4} \times \left(\frac{5}{10} \times \frac{4}{5}\right)$

Solution: $1\frac{1}{4} \times \left(\frac{5}{10} \times \frac{4}{5}\right) = \frac{5}{4} \times \left(\frac{5}{10} \times \frac{4}{5}\right)$

$$= \frac{5}{4} \times \left(\frac{\cancel{5}^{1} \times \cancel{4}^{2}}{\cancel{10}_{5} \times \cancel{5}_{1}}\right)$$

$$= \frac{5}{4} \times \left(\frac{1 \times 2}{5 \times 1}\right) = \frac{5}{4} \times \left(\frac{2}{5}\right)$$

$$= \frac{\cancel{5}^{1} \times \cancel{2}^{1}}{\cancel{4}_{2} \times \cancel{5}_{1}} = \frac{1}{2}$$

Thus, $1\frac{1}{4} \times \left(\frac{5}{10} \times \frac{4}{5}\right) = \frac{1}{2}$

Example 3. **Solve:** $1\frac{1}{2} \times \left(2\frac{1}{4} \times 3\frac{1}{3}\right)$

Solution: $1\frac{1}{2} \times \left(2\frac{1}{4} \times 3\frac{1}{3}\right)$

First convert mixed fractions into improper fractions

$$1\frac{1}{2} \times \left(2\frac{1}{4} \times 3\frac{1}{3}\right) = \frac{3}{2} \times \frac{9}{4} \times \frac{10}{3}$$

$$= \frac{3}{2} \times \left(\frac{\overset{3}{\cancel{9}} \times \overset{5}{\cancel{10}}}{\underset{2}{\cancel{4}} \times \underset{1}{\cancel{3}}}\right)$$

$$= \frac{3}{2} \times \left(\frac{3 \times 5}{2 \times 1}\right)$$

$$= \frac{3}{2} \times \left(\frac{15}{2}\right)$$

$$= \frac{3 \times 15}{2 \times 2} = \frac{45}{4} = 11\frac{1}{4}$$

Thus, $1\frac{1}{2} \times \left(2\frac{1}{4} \times 3\frac{1}{3}\right) = 11\frac{1}{4}$

Example 4. **Simplify** $\left(\frac{5}{9} \times \frac{6}{11}\right) \times \frac{21}{10}$

Solution: $\left(\frac{5}{9} \times \frac{6}{11}\right) \times \frac{21}{10} = \left(\frac{5 \times \overset{2}{\cancel{6}}}{\underset{3}{\cancel{9}} \times 11}\right) \times \frac{21}{10}$

$$= \left(\frac{5 \times 2}{3 \times 11}\right) \times \frac{21}{10} = \frac{10}{33} \times \frac{21}{10}$$

$$= \frac{\overset{1}{\cancel{10}} \times \overset{7}{\cancel{21}}}{\underset{11}{\cancel{33}} \times \underset{1}{\cancel{10}}} = \frac{1 \times 7}{11 \times 1}$$

$$= \frac{7}{11}$$

Thus, $\left(\frac{5}{9} \times \frac{6}{11}\right) \times \frac{21}{10} = \frac{7}{11}$

EXERCISE 3.3

Solve.

(1) $\frac{5}{6} \times 2\frac{1}{4} \times \frac{16}{5}$

(2) $\frac{7}{9} \times \left(2\frac{1}{4} \times \frac{8}{7}\right)$

(3) $\left(\frac{4}{5} \times \frac{10}{3}\right) \times \frac{9}{8}$

(4) $\left(\frac{3}{4} \times \frac{16}{5}\right) \times 1\frac{2}{3}$

(5) $\left(1\frac{3}{5} \times 10\frac{1}{2}\right) \times \frac{5}{21}$

(6) $\left(1\frac{1}{6} \times \frac{5}{6}\right) \times 5\frac{1}{7}$

(7) $1\frac{5}{16} \times \left(12\frac{1}{2} \times 1\frac{11}{21}\right)$

(8) $2\frac{5}{6} \times \left(1\frac{3}{17} \times 2\frac{1}{10}\right)$

(9) $\left(3\frac{9}{10} \times \frac{20}{36}\right) \times 1\frac{11}{13}$

(10) $\left(2\frac{4}{5} \times 1\frac{5}{7}\right) \times 2\frac{1}{12}$

(11) $4\frac{2}{7} \times \left(2\frac{5}{8} \times 1\frac{1}{9}\right)$

(12) $8\frac{1}{3} \times \left(2\frac{1}{10} \times \frac{1}{7}\right)$

Verify Distributive Laws:

There are two laws of distributive multiplication.

(1) Distributive law of multiplication over addition

(2) Distributive law of multiplication over subtraction

1. Distributive law of multiplication over addition

If $\frac{1}{2}$, $\frac{2}{3}$ and $\frac{1}{4}$ are any three fractions, then

Consider $\frac{1}{2} \times \left(\frac{2}{3} + \frac{1}{4}\right)$ and $\frac{1}{2} \times \frac{2}{3} + \frac{1}{2} \times \frac{1}{4}$

Let us verify it:

$$\frac{1}{2} \times \left(\frac{2}{3} + \frac{1}{4}\right) = \left(\frac{1}{2} \times \frac{2}{3}\right) + \left(\frac{1}{2} \times \frac{1}{4}\right)$$

$$\frac{1}{2} \times \left(\frac{8+3}{12}\right) = \frac{2}{6} + \frac{1}{8}$$

$$\frac{1}{2} \times \left(\frac{11}{12}\right) = \frac{8+3}{24}$$

$$\frac{11}{24} = \frac{11}{24}$$

So, LHS = RHS

Therefore, $\frac{1}{2} \times \left(\frac{2}{3} + \frac{1}{4}\right) = \left(\frac{1}{2} \times \frac{2}{3}\right) + \left(\frac{1}{2} \times \frac{1}{4}\right)$

This indicates distributive law of multiplication over addition.

Now verify it: $\left(\frac{2}{3} + \frac{1}{4}\right) \times \frac{1}{2} = \left(\frac{3}{2} \times \frac{1}{2}\right) + \left(\frac{1}{4} \times \frac{1}{2}\right)$

2. Distributive law of multiplication over subtraction

If $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ are any three fractions, then

Consider $\frac{1}{2} \times \left(\frac{1}{3} - \frac{1}{4}\right)$ and $\left(\frac{1}{2} \times \frac{1}{3}\right) - \left(\frac{1}{2} \times \frac{1}{4}\right)$

Let us verify it: $\frac{1}{2} \times \left(\frac{1}{3} - \frac{1}{4}\right) = \left(\frac{1}{2} \times \frac{1}{3}\right) - \left(\frac{1}{2} \times \frac{1}{4}\right)$

$$\frac{1}{2} \times \left(\frac{4-3}{12}\right) = \frac{1}{6} - \frac{1}{8}$$

$$\frac{1}{2} \times \frac{1}{12} = \frac{4-3}{24}$$

$$\frac{1}{24} = \frac{1}{24}$$

So, LHS = RHS

Therefore, $\frac{1}{2} \times \left(\frac{1}{3} - \frac{1}{4}\right) = \frac{1}{2} \times \frac{1}{3} - \frac{1}{2} \times \frac{1}{4}$

This indicates distributive law of multiplication over subtraction.

Now verify it: $\left(\frac{1}{3} - \frac{1}{4}\right) \times \frac{1}{2} = \left(\frac{1}{3} \times \frac{1}{2}\right) - \left(\frac{1}{4} \times \frac{1}{2}\right)$

EXERCISE 3.4

A. Verify the distributive law of multiplication over addition in the following.

(1) $\frac{2}{5} \times \left(\frac{3}{7} + \frac{4}{5}\right) = \left(\frac{2}{5} \times \frac{3}{7}\right) + \left(\frac{2}{5} \times \frac{4}{5}\right)$

(2) $\frac{7}{9} \times \left(\frac{1}{4} + \frac{1}{3}\right) = \left(\frac{7}{9} \times \frac{1}{4}\right) + \left(\frac{7}{9} \times \frac{1}{3}\right)$

(3) $\frac{2}{7} \times \left(\frac{3}{8} + \frac{1}{5}\right) = \left(\frac{2}{7} + \frac{3}{8}\right) + \left(\frac{2}{7} \times \frac{1}{5}\right)$

(4) $\left(\frac{1}{9} + \frac{4}{9}\right) \times \frac{3}{4} = \left(\frac{1}{9} \times \frac{3}{4}\right) + \left(\frac{4}{9} \times \frac{3}{4}\right)$

B. Verify the distributive law of multiplication over subtraction in the following.

(1) $\frac{1}{2} \times \left(\frac{3}{4} - \frac{2}{3}\right) = \left(\frac{1}{2} \times \frac{3}{4}\right) - \left(\frac{1}{2} \times \frac{2}{3}\right)$

(2) $\frac{1}{5} \times \left(\frac{1}{2} - \frac{1}{3}\right) = \left(\frac{1}{5} \times \frac{1}{2}\right) - \left(\frac{1}{5} \times \frac{1}{3}\right)$

(3) $\left(\frac{4}{5} - \frac{3}{4}\right) \times \frac{2}{3} = \left(\frac{4}{5} \times \frac{2}{3}\right) - \left(\frac{3}{4} \times \frac{2}{3}\right)$

(4) $\frac{5}{6} \times \left(\frac{4}{7} - \frac{1}{2}\right) = \left(\frac{5}{6} \times \frac{4}{7}\right) - \left(\frac{5}{6} \times \frac{1}{2}\right)$

Solve real life problems involving multiplication of fractions

Example 1. There were 56 students in class five. On a rainy day $\frac{1}{8}$ of them absent. How many were present?

Solution: Total number of students $= 56$

Number of students absent on rainy day $= \frac{1}{8}$ of $56 = \frac{1}{8} \times 56$

$= \frac{1}{8} \times \frac{56}{1} = \frac{1 \times \cancel{56}^{7}}{\cancel{8}_{1} \times 1} = \frac{1 \times 7}{1 \times 1} = 7$

Total number of students	−	Number of students absent	=	Number of students present
56	−	7	=	**49**

Hence **49** students were present on rainy day.

Example 2.

The engineers drilled $\frac{5}{6}$ km of a tunnel in January and drilled only $\frac{1}{6}$ of previous drill in February. What fraction of the tunnel they drilled in February?

Solution:

Engineer drilled in January = $\frac{5}{6}$ km of a tunnel

They drilled in February $\frac{1}{6}$ of the $\frac{5}{6}$ km in January

$$= \frac{5}{6} \times \frac{1}{6} \text{ km} = \frac{5}{36} \text{ km}$$

$$= \frac{5}{6} \text{ of } \frac{1}{6} \text{ means } = \frac{5}{36}$$

Thus they drilled $\frac{5}{36}$ km in February

EXERCISE 3.5

1. The height of a door is $2\frac{2}{3}$ metres. Out of which $\frac{1}{8}$ the part was trimmed off. How much was trimmed off?

2. On Monday one-tenth of the total number of students were on leave. If the total number of the students are enrolled 550. How many students were present?

3. A surgeon advised an operating room technician to arrange 12 drips of dextrose solution. The hospital has only $\frac{2}{3}$ of the required dextrose. How many drips are available in the hospital?

4. A lady used $\frac{1}{5}$ of 50 kg of wheat for making bread. If she makes bread twice a day, then how much wheat will be used?

5. Find the price of 13 dozen of eggs; if the price of one egg is Rs $9\frac{1}{2}$.

6. A lady bought $5\frac{2}{5}$ metres of cltoh. She used $\frac{1}{3}$ of the cloth in making a TV cover. How much cloth she used?

7. A cooler holds 8 bottles of water. If one bottle is holding $2\frac{1}{2}$ litre water, find the capacity of full cooler.

8. What is the total length of the cloth? If it consists of 12 pieces of cloth and each piece is of length $1\frac{1}{2}$ metres.

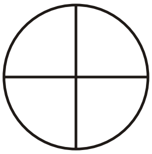
9. The cost of 1 kg potatoes is Rs 45. Find the cost of $15\frac{2}{4}$ kg of that potatoes.

10. A piece of wire is $8\frac{1}{3}$ metre long. Find the total length of wire, if there are $13\frac{1}{5}$ such small pieces.

3.3 DIVISION

Divide a fraction by a number

If we divide a circle into four equal parts.
How many quarters are in one whole?



That is $\frac{1}{1} \quad \frac{1}{4} = \boxed{4}$

Or $\frac{1}{1} \times \frac{4}{1} = \frac{1 \times 4}{1 \times 1} = 4$ quarters.

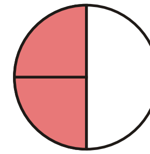
Here, $\frac{4}{1}$ is reciprocal of $\frac{1}{4}$

Again how many quarters in one half?

Teacher's Note Teacher should explain the students to divide a fraction by a whole number we need to multiply by the reciprocal of the numbers.

That is $\frac{1}{2} \quad \frac{1}{4} = \frac{1}{2} \times \frac{4}{1}$

$= \frac{1 \times \cancel{4}^{2}}{2 \times 1} =$ 2 quarters



Let us consider the following examples:

Example 1. **Simplify:** $\mathbf{\frac{1}{5} \quad 3}$

Solution: $\frac{1}{5} \quad 3 = \frac{1}{5} \quad \frac{3}{1}$, $\frac{1}{5} \quad \frac{3}{1}$ means $\frac{1}{5} \times \frac{1}{3}$

$= \frac{1}{5} \times \frac{1}{3}$ ($\frac{1}{3}$ is reciprocal of 3)

$= \frac{1 \times 1}{5 \times 3} = \frac{1}{15}$

Similarly simplify $\frac{1}{3} \quad 5$

$\frac{1}{3} \quad 5 = \frac{1}{3} \times \frac{1}{5}$ ($\frac{1}{5}$ is reciprocal of 5)

$= \frac{1 \times 1}{5 \times 3} = \frac{1}{15}$

Example 2. **Divide $\mathbf{1\frac{5}{9}}$ by 7**

Solution:

First we change the mixed fraction into an improper fraction.

$\frac{14}{9} \quad 7$

$= \frac{14}{9} \times \frac{1}{7}$ ($\frac{1}{7}$ is reciprocal of 7)

$= \frac{14 \times 1}{9 \times 7} = \frac{\cancel{14}^{2} \times 1}{9 \times \cancel{7}_{1}} = \frac{2}{9}$

Thus, $1\frac{5}{9} \quad 7 = \frac{2}{9}$

To divide a fraction by a non-zero whole number, we multiply the fraction by the reciprocal of the whole number.

EXERCISE 3.6

A. Write the reciprocals of each of the following.

(1) 2 (2) 4 (3) $\frac{1}{3}$ (4) $\frac{1}{5}$ (5) $\frac{1}{10}$

(6) $\frac{3}{4}$ (7) $2\frac{6}{7}$ (8) $1\frac{8}{5}$ (9) $2\frac{1}{3}$ (10) $4\frac{2}{3}$

B. Solve.

(1) $\frac{1}{2} \quad \frac{5}{6}$ (2) $\frac{2}{3} \quad 4$ (3) $\frac{3}{4} \quad 6$ (4) $\frac{4}{5} \quad 8$

(5) $\frac{5}{6} \quad 10$ (6) $\frac{4}{5} \quad 12$ (7) $\frac{7}{8} \quad 14$ (8) $\frac{8}{9} \quad 24$

(9) $2\frac{2}{5} \quad 36$ (10) $1\frac{1}{9} \quad 20$ (11) $2\frac{1}{5} \quad 55$ (12) $3\frac{1}{3} \quad 5$

Divide a fraction by another fraction (proper, improper and mixed)

To divide a fraction by another fraction is to multiply the first fraction by the reciprocal of another given fraction. Consider the following examples.

Example 1. Divide $\frac{9}{16}$ by $\frac{3}{4}$

Solution: $\frac{9}{16} \quad \frac{3}{4} = \frac{9}{16} \times \frac{4}{3}$ ($\frac{4}{3}$ is reciprocal of $\frac{3}{4}$)

$$= \frac{9 \times 4}{16 \times 3} = \frac{^{3}\cancel{9} \times \cancel{4}^{1}}{_{4}\cancel{16} \times \cancel{3}_{1}}$$

$$= \frac{3 \times 1}{4 \times 1} = \frac{3}{4}$$

Example 2. **Divide $\frac{7}{4}$ by $\frac{5}{4}$**

Solution: $\frac{7}{4} \quad \frac{5}{4} = \frac{7}{4} \times \frac{4}{5}$

$$= \frac{7 \times 4}{4 \times 5} = \frac{7 \times \cancel{4}^{1}}{\cancel{4}_{1} \times 5} = \frac{7}{5} = 1\frac{2}{5}$$

Hence, $\frac{7}{4} \quad \frac{5}{4} = 1\frac{2}{5}$

Example 3. **Divide $2\frac{5}{8}$ by $2\frac{1}{3}$**

Solution: First we change mixed fraction into improper fraction.

$$2\frac{5}{8} \quad 2\frac{1}{3} = \frac{2 \times 8 + 5}{8} \quad \frac{2 \times 3 + 1}{3}$$

$$= \frac{16 + 5}{8} \quad \frac{6 + 1}{3} = \frac{21}{8} \quad \frac{7}{3} = \frac{21}{8} \times \frac{3}{7}$$

$$= \frac{{}^{3}\cancel{21} \times 3}{8 \times \cancel{7}_{1}} = \frac{3 \times 3}{8 \times 1} = \frac{9}{8} = 1\frac{1}{8}$$

Thus, $2\frac{5}{8} \quad 2\frac{1}{3} = 1\frac{1}{8}$

EXERCISE 3.7

Solve the following.

(1) $\frac{1}{2} \quad \frac{3}{4}$	(2) $\frac{7}{6} \quad \frac{4}{9}$	(3) $\frac{3}{4} \quad \frac{15}{16}$
(4) $\frac{9}{7} \quad \frac{81}{14}$	(5) $\frac{1}{6} \quad \frac{1}{12}$	(6) $\frac{11}{22} \quad \frac{11}{22}$
(7) $\frac{16}{9} \quad \frac{4}{3}$	(8) $\frac{20}{30} \quad \frac{40}{30}$	(9) $1\frac{1}{4} \quad \frac{1}{4}$
(10) $\frac{2}{3} \quad 4\frac{3}{4}$	(11) $8\frac{1}{2} \quad 3\frac{1}{2}$	(12) $2\frac{1}{5} \quad 1\frac{1}{6}$
(13) $9\frac{3}{5} \quad 2\frac{1}{4}$	(14) $3\frac{8}{9} \quad 1\frac{1}{9}$	(15) $10\frac{1}{9} \quad 4\frac{3}{4}$

Solve real life problems involving division of fractions

Example 1. How many half metre pieces can be cut from a stick which is $12\frac{1}{2}$ metres long?

Solution: Length of stick $= 12\frac{1}{2}$ m (Dividend $12\frac{1}{2}$ a mixed fraction)

Length of one of the required piece $= \frac{1}{2}$ m (Divisor $\frac{1}{2}$ is proper fraction)

Total numbers of pieces $= 12\frac{1}{2} \quad \frac{1}{2} = \frac{25}{2} \quad \frac{1}{2}$

(Reciprocal of $\frac{1}{2}$ is $\frac{2}{1}$)

$$= \frac{25}{2} \times \frac{2}{1} = \frac{25 \times \cancel{2}^{1}}{\cancel{2}_{1} \times 1} = \boxed{25}$$

Thus, we get **25** pieces.

EXERCISE 3.8

1. Talib buys $10\frac{1}{2}$ kg tomatoes for Rs 210. What is the price of 1 kg of tomatoes?
2. One-fifth of the 35 cars in the parking area are blue. How many blue cars are there in the parking area?
3. Naila buys $\frac{7}{3}$m piece of a lace. She wants to make its small pieces at length $\frac{1}{12}$ m. How many pieces can be made?
4. The camp cook made $1\frac{3}{4}$ kg of baked beans. Each serving of beans is $\frac{1}{4}$ kg. How many servings of beans did the cook make?

5. A road is $50\frac{1}{2}$ metre long. Half of it was damaged in rain. How much road is safe?

6. Rehan bought $82\frac{1}{2}$ metre cloth. He used this cloth for making uniform of 15 children of equal size. How much is cloth used in each dress?

7. A plastic drum holds $49\frac{1}{2}$ litres drinking water. How many bottles holding $1\frac{1}{2}$ litres of drinking water can be filled from it?

8. A boy completes $8\frac{3}{4}$ km in $2\frac{1}{2}$ hours on bicycle in a race. How much distance does he complete in 1 hour?

3.4 SIMPLIFY EXPRESSIONS INVOLVING FRACTIONS USING BODMAS RULE

We know that in BODMAS, B stands for Brackets, O stands for Of, D stands for Division, M stands for Multiplication, A stands for Addition and S stands for Subtraction.

Preference of solving brackets is as follows:
(i) ( ) parentheses, (ii) { } curly brackets and
(iii) [ ] square brackets.

To simplify the order of operation using BODMAS rule as;
first of all start solving inside the 'Brackets' in following order:
( ), { } and [ ].

Next solve the mathematical operations first, 'Of'. Next to calculate 'Division' and 'Multiplication'. In last 'Addition' and 'Subtraction' are performed.

Example 1: **Simplify by using BODMAS rule:**

$$\frac{5}{3} \times \left(1\frac{1}{3} - \frac{1}{2}\right) \quad \frac{5}{2}$$

Solution:

Solve operations within 'brackets'.

$$\frac{5}{3} \times \left(1\frac{1}{3} - \frac{1}{2}\right) \quad \frac{5}{2} = \frac{5}{3} \times \left(\frac{4}{3} - \frac{1}{2}\right) \quad \frac{5}{2}$$

$$= \frac{5}{3} \times \left(\frac{8-3}{6}\right) \quad \frac{5}{2} \text{ (By taking LCM)}$$

$$= \frac{5}{3} \times \frac{5}{6} \quad \frac{5}{2}$$

$$= \frac{5}{3} \times \frac{5}{6} \times \frac{2}{5} \text{ } \left(\frac{2}{5} \text{ is reciprocal of } \frac{5}{2}\right)$$

$$= \frac{5 \times \overset{1}{\cancel{5}} \times \overset{1}{\cancel{2}}}{3 \times \underset{3}{\cancel{6}} \times \underset{1}{\cancel{5}}} = \frac{5 \times 1 \times 1}{3 \times 3 \times 1} = \frac{5}{9}$$

Example 2. **Simplify** $\frac{1}{2}$ **of** $\frac{4}{5} + \left(2\frac{1}{3} - 1\frac{1}{4}\right)$

Solution: First solve within bracket.

$$\left(\frac{1}{2} \text{ of } \frac{4}{5}\right) + \left(2\frac{1}{3} - 1\frac{1}{4}\right)$$

$$= \left(\frac{1}{2} \times \frac{4}{5}\right) + \left(\frac{3 \times 2 + 1}{3} - \frac{4 \times 1 + 1}{4}\right)$$

$$= \left(\frac{1 \times \overset{2}{\cancel{4}}}{\underset{1}{\cancel{2}} \times 5}\right) + \left(\frac{7}{3} - \frac{5}{4}\right)$$

$$= \left(\frac{1 \times 2}{1 \times 5}\right) + \left(\frac{28 - 15}{12}\right)$$

$$= \frac{2}{5} + \frac{13}{3}$$

$$= \frac{6 + 65}{15} = \frac{71}{15} = 4\frac{11}{15}$$

EXERCISE 3.9

(1) $\frac{3}{4} + \frac{2}{9} \times 4\frac{1}{3} \quad 3\frac{1}{4}$

(2) $\frac{1}{4} \times \left(\frac{8}{3} + \frac{2}{7}\right)$

(3) $\frac{1}{2} + \left(\frac{3}{4} \times 1\frac{7}{33} - \frac{1}{3}\right)$

(4) $\left(3\frac{1}{6} - 1\frac{1}{4}\right) \times 2$

(5) $\left(\frac{4}{5} - \frac{3}{10}\right) \times \left(\frac{1}{2} + \frac{3}{4}\right)$

(6) $\left(2\frac{1}{2} \quad \frac{3}{4}\right) \times \frac{3}{7} - \left(\frac{1}{4} + \frac{1}{8}\right)$

(7) $1\frac{3}{5} \times \left(\frac{4}{3} - \quad \frac{3}{4} + 2\frac{1}{3}\right) \quad 1\frac{2}{7}$

(8) $1\frac{1}{6} + \left(2\frac{3}{4} \times 3\frac{1}{3} \quad 2\frac{1}{4}\right) - 7\frac{1}{2}$

(9) $\left(1\frac{3}{5} \text{ of } \frac{5}{6}\right) - \left(2\frac{3}{7} + 1\frac{1}{5}\right)$

(10) $\left(\frac{5}{4} + \frac{8}{3}\right) \times \left(\frac{10}{3} + \frac{5}{2}\right)$

(11) $20 + 5 \text{ of } 9 - \left(1\frac{2}{3} \times \frac{1}{5}\right)$

(12) $4\frac{1}{2} + \left(5\frac{1}{3} \text{ of } 3\right) - 2\frac{2}{3}$

REVIEW EXERCISE 3

(1) Write 'T' for true and 'F' for false.

(i) $4\frac{2}{3}$ is an example of an improper fraction. ☐

(ii) $\frac{1}{3} \quad \frac{3}{1} = \frac{1}{9}$ ☐

(iii) The lowest form of $\frac{12}{4} = \frac{1}{3}$ ☐

(iv) $\frac{3}{4} - \frac{1}{2} = \frac{1}{4}$ ☐

(v) $\frac{1}{3}, \frac{2}{6}, \frac{3}{9}$ are equivalent fractions. ☐

(vi) The reciprocal of $2\frac{1}{2}$ is $\frac{2}{5}$. ☐

(vii) $\frac{3}{4}$ of a dozen is 9. ☐

(viii) $1\frac{1}{2}$ m equal to 150 cm. ☐

(2) Solve the following.

(i) Five ball points are bought for Rs $50\frac{3}{4}$. Find the price of one ball point.

(ii) Afzal and Fazila bought a chocolate bar. Afzal got $\frac{2}{5}$ and Fazila got $\frac{3}{10}$. Who got more and by how much?

(iii) Find the price of 2 dozen packets of biscuit, if the price of one packet is Rs $12\frac{1}{2}$.

(iv) Shumaila buys $2\frac{1}{4}$ m ribbon. She used $1\frac{7}{8}$ m of it. How much ribbon is left?

(v) $75\frac{3}{4}$ kg of tea is packed into packets. Each packet contains $\frac{3}{8}$ kg of tea. How many packets are needed to fill the tea?

(vi) At a charity show each student in a school purchases a ticket costing Rs $30\frac{3}{4}$. If the amount collected is Rs 24600. Find the number of tickets sold.

(vii) Solve. (a) $2\frac{1}{3} - \left(\frac{16}{5} \div 1\frac{7}{8} \text{ of } 2\frac{2}{15}\right) + 1\frac{1}{8}$

(b) $\frac{3}{4} + \frac{3}{4} \text{ of } \frac{3}{4} \div \frac{3}{4} - \left(\frac{3}{4} \times \frac{3}{4}\right)$

Unit 4

DECIMALS AND PERCENTAGES

4.1 DECIMALS

Decimal is a number that contains fractional part, such as: 0.4, 6.5, 17.23 are all decimals. We also know that the number of digits at the right hand side of a decimal point determines the number of decimal places. For example 7.6, 4.8, 0.2, 0.9 are all decimal fractions up to one decimal place.

6.37, 4.95, 0.12, 9.08 are all decimal fractions up to two decimal places.

Similarly a fraction which has three digits after decimal point is called a decimal fraction up to three decimal places. 1.002, 4.036, 5.123 are all decimal fractions up to three decimal places.

In decimal fraction, the place values of the digits increase 10 times on moving from right to left. Conversely reduce to $\frac{1}{10}$th on proceeding from left to right.

Place value of 111.111, 222.222, 333.333 and 888.888 are given below:

Number	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
111.111	100	10	1	$\frac{1}{10} = 0.1$	$\frac{1}{100} = 0.01$	$\frac{1}{1000} = 0.001$
222.222	200	20	2	$\frac{2}{10} = 0.2$	$\frac{2}{100} = 0.02$	$\frac{2}{1000} = 0.002$
333.333	300	30	3	$\frac{3}{10} = 0.3$	$\frac{3}{100} = 0.03$	$\frac{3}{1000} = 0.003$
888.888	800	80	8	$\frac{8}{10} = 0.8$	$\frac{8}{100} = 0.08$	$\frac{8}{1000} = 0.008$

Teacher's Note

Teacher should explain the students, when the digit moves one step to the right, the place value becomes $\frac{1}{10}$ (one-tenth).

Let us consider the place value of the position of each digit in 765.984

Hundreds	Tens	Ones	Decimal	Tenths	Hundredths	Thousandths
7	6	5	.	9	8	4

The decimal point separates the whole number part from the fractional part. If a number consists of only a decimal part, then we take zero as whole number.

For Example:

.45 = 0.45, .06 = 0.06 and .007 = 0.007

Again if a number consists of only a whole number part and we want to describe it in decimals, we take zero as decimal. For example 36 = 36.0 upto one decimal place or 36.00 upto two decimal places.

Add and subtract decimals

In previous class we have learnt about decimals, conversion between fractions and decimals and basic operations on decimals.

Now we learn addition and subtraction of decimals.

Let us consider the following examples:

Example 1. Add the following:

(i) 20.25 + 7.52 (ii) 234.452 + 23.23

(iii) 109.25 + 7.589 (iv) 608.56 + 23.068

Solution: (i) 20.25 + 7.52

For adding these decimal fractions, write the given fractions in vertical form in such a way, that decimal points of both addends will be placed right below each other. Then add by using rules as we have already learned.

Teacher's Note Teacher should help the students to put the decimal point in the correct place.

(i)
```
   20.25
 +  7.52   means
 -------
   27.77
```

	Tens	Ones	Decimal	Tenths	Hundredths
	2	0	.	2	5
+	0	7	.	5	2
	2	7	.	7	7

Write zero (0) where there is no digit like in the given example.

(ii)
```
   234.452
 +  23.230
 ---------
   257.682
```

(iii)
```
   109.250
 +   7.589
 ---------
   116.839
```

(iv)
```
   608.560
 +  23.068
 ---------
   631.628
```

Example 2. Subtract the following:

(i) 58.75 – 17.50 (ii) 782.65 – 293.562

(iii) 422.785 – 206.5 (iv) 845. 506 – 458.068

Solution: (i) 58.75 – 17.50

For subtracting these decimal fractions, write the given fractions in vertical form in such a way that decimal points of both the numbers will be right below each other. Then subtract by using rules as we have already learned.

(i)
```
   58.75
 – 17.50  means
 -------
   41.25
```

	Tens	Ones	Decimal	Tenths	Hundredths
	5	8	.	7	5
–	1	7	.	5	0
	4	1	.	2	5

Write zero (0) where there is no digit like in the given example.

(ii)
```
   782.650
 – 293.562
 ---------
   489.088
```

(iii)
```
   422.785
 – 206.500
 ---------
   216.285
```

(iv)
```
   845.506
 – 458.068
 ---------
   387.438
```

EXERCISE 4.1

A. Add the following:

(1) 22.32 + 6.46 (2) 4.567 + 36.4 (3) 75.05 + 24.62
(4) 257.003 + 0.25 (5) 40.123 + 7.32 (6) 45.005 + 52.47
(7) 345.38 + 786.46 (8) 674.567 + 36.48
(9) 45.75 + 54.69 (10) 287.099 + 8.258
(11) 45.468 + 277.358 (12) 35.69 + 875.875

B. Subtract the following:

(13) 25.52 – 6.3 (14) 74.567 – 33.402
(15) 75.75 – 24.62 (16) 257.003 – 0.25
(17) 49.123 – 7.02 (18) 757.785 – 152.005
(19) 786.46 – 345.38 (20) 674.567 – 36.48
(21) 85.75 – 54.65 (22) 287.099 – 174.055
(23) 845.468 – 234.358 (24) 935.69 – 805.365

Recognize like and unlike decimals

In previous class we have learnt fractions with same denominators. For example, $\frac{2}{7}$, $\frac{3}{7}$, $\frac{4}{7}$, $\frac{5}{7}$. Such fractions which have same denominators are known as like fractions. Similarly fractions with different denominators are known as unlike fractions for example $\frac{3}{5}$, $\frac{2}{7}$ and $\frac{1}{2}$ etc.

Decimal fractions with same number of decimal places like 4.5, 6.3, 56.7 are some examples of **like decimals**.

The decimals like 34.0, 567.24, 234.7802 are some **unlike decimals**.

Example 1: Recognize decimals of the 2-decimal places of the following:

(i) 6.3, 0.25, 25.52, 643.2, 342.81, 14.025, 67.9 and 8.01

Solution:

0.25, 25.52, 342.81 and 8.01 are like decimals with two decimal places.

Multiply decimals by 10, 100 and 1000

Consider the following examples.

Example 1. Find the product.

(i) 2.23 x 10 (ii) 2.23 x 100 (iii) 2.23 x 1000

Solution:

(i) 2.23 x 10 = 2.230 = 22.30 = **22.3**

What happen to value of 2.23

Multiply a decimal by 10, then the value of the decimals increases ten times.

(ii) 2.23 x 100 = 2.2300 = 223.00 = **223.**

Multiply a decimal by 100 then the value of the decimals increases hundred times.

(iii) 2.23 x 1000 = 2.23000 = 2230.00 = **2230.**

Multiply a decimal by 1000, then the value of the decimals increases one thousand times.

EXERCISE 4.2

A. Separate the like decimals of one, two and three decimal places from the following.

0.08, 2.123, 34.25, 0.6, 3.36, 52.30, 38.66 and 62.1.

B. Find the product of the following by using the rules of multiplication:

(1) 0.175 x 10	(2) 0.175 x 100	(3) 0.175 x 1000
(4) 35.058 x 10	(5) 35.058 x 100	(6) 35.058 x 1000
(7) 8.15 x 10	(8) 8.15 x 100	(9) 8.15 x 1000
(10) 324.423 x 10	(11) 324.423 x 100	(12) 324.423 x 1000
(13) 0.0067 x 10	(14) 0.0067 x 100	(15) 0.0067 x 1000

Divide decimals by 10, 100 and 1000

Rules:

1. Divide a decimals by 10, then the value of the decimals decreases ten times.

   1.5.34 ÷ 10 = 1.534

   (What happened to value of 15.35?)

2. Divide a decimals by 100 then the value of the decimals decreases hundred times.

   15.34 ÷ 100 = 0.1534

3. Divide a decimals by 1000, then the value of the decimals decreases one thousand times.

   015.34 ÷ 1000 = 0.01534

By using the above rules we can easily divide the decimal fractions by 10, 100, and 1000.

Example 1: Solve by using the above stated rules:

(1) 0.0175 ÷ 10 (2) 0.0175 ÷ 100

(3) 0.0175 ÷ 1000

Solution:

We can observe that the value of decimals

(1) 0.0175 ÷ 10 = **0.00175** (decreases ten times)

(2) 0.0175 ÷ 100 = **0.000175** (decreases hundred times)

(3) 0.0175 ÷ 1000 = **0.0000175** (decreases thousand times)

EXERCISE 4.3

A. Solve the following by using the rules of division as stated above:

(1) 6.675 ÷ 10	(2) 6.675 ÷ 100	(3) 6.675 ÷ 1000
(4) 35.89 ÷ 10	(5) 35.89 ÷ 100	(6) 35.89 ÷ 1000
(7) 815.4 ÷ 10	(8) 815.4 ÷ 100	(9) 815.4 ÷ 1000
(10) 0.085 ÷ 10	(11) 0.085 ÷ 100	(12) 0.085 ÷ 1000

Multiply a decimal with a whole number

We consider the following examples.

Example 1. Find the product:

(i) 0.231 x 2 (ii) 4.4 x 4 (iii) 2.3 x 24

Solution:

(i) 0.231 x 2 =

$$\begin{array}{r} 0.231 \\ \times\ 2 \\ \hline 0.462 \\ \hline \end{array}$$

(ii) 4.4 x 4 =

$$\begin{array}{r} 4.4 \\ \times\ 4 \\ \hline 17.6 \\ \hline \end{array}$$

(iii) 2.3 x 24

Solution:

2.3
x 24
92
460
55.2

Step 1: Neglect the decimal point. Multiply 3 by 4, We get 12, write 2 at first place and carry 1. Multiply 2 by 4, we get 8, add 1 in 8, we get 9, write in second place, we get 92.

Step 2: Write 0 in ones place. Multiply 3 by 2, we get 6, write 6 after zero. Now multiply 2 by 2, we get 4.

Step 3: Add all the digits of ones and tens, we get 552.

Step 4: Count decimal places in given numbers to be multiplied.

Step 5: Put a decimal point after one digit, count from right digit. We get 55.2

EXERCISE 4.4

Find the product:

(1) 6.5 x 5	(2) 3.5 x 6	(3) 0.65 x 5
(4) 0.65 x 6	(5) 0.35 x 8	(6) 4.25 x 7
(7) 4.25 x 8	(8) 4.25 x 9	(9) 0.382 x 5
(10) 0.394 x 8	(11) 24.58 x 7	(12) 53.69 x 9
(13) 4.25 x 27	(14) 0.265 x 36	(15) 2.785 x 435
(16) 4.25 x 162	(17) 47.326 x 348	(18) 58.967 x 564

Divide a decimal with a whole number.

Consider the following examples:

Example 1. Solve: 0.9 ÷ 3

Solution: 0.9 ÷ 3 = 9 Tenths ÷ 3

= (9÷3) Tenths = 3 Tenths

= 0.3

```
3 ) 0.9 ( 0.3
   - 9
     0
```

Example 2. Solve: 0.84 ÷ 4

Solution: 0.84 ÷ 4 = (0.80 + 0.04) ÷ 4

= (8 tenths ÷ 4) + (4 hundredths ÷ 4)

= 2 tenths + 1 hundredth

= 20 hundredths + 1 hundredth = 21 hundredths

= 0.21

```
4 ) 0.84 ( 0.21
   - 8
      4
    - 4
      0
```

Teacher's Note

Teacher may ask students to see and note how the decimals are lined up in the original number and in the answer (quotient).

Example 3. Solve: 25.85 ÷ 5

Solution: (25 + 0.8 + 0.05) ÷ 5

25.85 ÷ 5 = (25 ÷ 5) + (8 Tenths ÷ 5) + (5 Hundredths ÷ 5)

= (5) + (0.8 ÷ 5) + (0.05 ÷ 5)
= 5 + 0.16 + 0.01
= 5.17

OR

$$
\begin{array}{r|l}
5 & 25.85 \;(\,5.17 \\
 & -\,25 \\ \hline
 & 8 \\
 & -\,5 \\ \hline
 & 35 \\
 & -\,35 \\ \hline
 & 0
\end{array}
$$

Verify

5.17	Quotient
x 5	Divisor
25.85	Dividend

So, 25.85 ÷ 5 = 5.17

EXERCISE 4.5

A. Solve:

(1) 0.65 ÷ 5 (2) 6.5 ÷ 5 (3) .065 ÷ 5

(4) 3.6 ÷ 6 (5) 0.64 ÷ 8 (6) 4.27÷ 7

(7) 9.6 ÷ 8 (8) 44.1 ÷ 9 (9) 0.385 ÷ 5

(10) 8.394 ÷ 6 (11) 39.851 ÷ 7 (12) 87.03 ÷ 9

B. Solve up to 3-decimal places:

(1) 40.25 ÷ 4 (2) 89.64 ÷ 6 (3) 98.58 ÷ 3

(4) 24.25 ÷ 10 (5) 0.265 ÷ 20 (6) 2.785 ÷ 25

(7) 3.16 ÷ 2.31 (8) 0.555 ÷ 5.5 (9) 14.04 ÷ 12.4

Multiply a decimal by tenths and hundredths only

We have already learnt:

One-Tenth = 0.1 and One-Hundredth = 0.01

Now consider the following examples.

Example 1. Find the product:

(i) 2.23 x 0.1 (ii) 2.23 x 0.01

(iii) 2.23 x 0.5 (iv) 2.23 x 0.07

Solution:

(i)
$$\begin{array}{r} 2.23 \\ \times\ 0.1 \\ \hline 0.223 \\ \hline \end{array}$$

(ii)
$$\begin{array}{r} 2.23 \\ \times\ 0.01 \\ \hline 0.0223 \\ \hline \end{array}$$

(iii)
$$\begin{array}{r} 2.23 \\ \times\ 0.5 \\ \hline 1.115 \\ \hline \end{array}$$

(iv)
$$\begin{array}{r} 2.23 \\ \times\ 0.07 \\ \hline 0.1561 \\ \hline \end{array}$$

Example 2. Find the product of: 0.04 x 0.2

Solution:

0.04 x 0.2 = 0.008 → 0.04 x 0.2 = 0.008 (product)

0.04 → 2 decimal places; 0.2 → 1 decimal place; 0.008 → 3 decimal places

in 0.04 we have 2 decimal places and in 0.2 we have one decimal place. When we write their product then add decimals and get 3 decimal places. Count from right up to 3 decimal places and if digits are less than 3 places, write zeros as we need, as shown in the example, we write 2 zeros.

Thus, we get 0.008

EXERCISE 4.6

Find the product of the following:

(1) 2.6 x 0.1	(2) 3.87 x 0.2	(3) 42.5 x 0.3
(4) 59.95 x 0.4	(5) 0.3 x 0.5	(6) 0.01 x 0.6
(7) 1.1 x 0.4	(8) 1.05 x 0.2	(9) 2.6 x 0.03
(10) 0.3 x 0.01	(11) 0.01 x 0.01	(12) 1.1 x 0.08
(13) 3.87 x 0.06	(14) 42.5 x 0.05	(15) 59.95 x 0.07

Multiply a decimal by a decimal (with three decimal places)

Consider the following examples:

Example 1. Find the product of: 0.25 x 0.056

Solution:

0.25 x 0.056 =

```
    0.0 5 6  ——→ 3 decimal places
  x 0. 2 5   ——→ 2 decimal places
  ---------
      2 8 0
    1 1 2 x
  ---------
    1 4 0 0
  ---------
```

So, we get the product (3 + 2 = 5 decimals) **0.01400 = 0.014**

Or 0.25 x 0.056 = 0.01400 = 0.014

0.25 → 2 decimal place; 0.056 → 3 decimal places; 0.01400 → 5 decimal places

Teacher's Note Teacher should ask students to write the given number and the product in place value chart, then compare the values of both.

Example 2. Solve 0.045 x 0.68

Solution:

0.045 x 0.68 = 0.03060 = 0.0306

- 0.045 → 3 decimal places
- 0.68 → 2 decimal places
- 0.03060 → 5 decimal places

0.0 4 5
x 0. 6 8
3 6 0
2 7 0 x
3 0 6 0

Thus, 0.045 x 0.68 = 0.03060 = **0.0306**

Multiply a decimal by a decimal (in the same way as for whole numbers and then in the decimal point accordingly)

To multiply a decimal by a decimal in the same way as for whole numbers. Let us consider the following examples.

Example:

Find the product:

(i) 1.9 x 2.7 (ii) 28.5 x 1.25

Solutions:

(i) Number of decimal places in 1.9 is one.
Number of decimal places in 2.7 is one .
Number of decimal places in the product will be 1 + 1 = 2 .
Therefore, 1.9 x 2.7 = **5.13**

1 . 9
x 2 . 7
1 3 3
3 8 x
5 . 1 3

(ii) Number of decimal places in 28.5 is one and in 1.25 is two.
Number of decimal places in the product will be 1 + 2 = 3.
Therefore, 28.5 x 1.25 = **35.625**

2 8 . 5
x 1 . 2 5
1 4 2 5
5 7 0 x
2 8 5 x x
3 5 . 6 2 5

EXERCISE 4.7

A. Put the decimal point at the appropriate place in each answer.

(1) 46.7 x 1.2 = 5 6 0 4

(2) 0.754 x 1.2 = 0 9 0 4 8

(3) 3.57 x 1.2 = 4 2 8 4

(4) 68.2 x 1.2 = 8 1 8 4

(6) 0.402 x 1.2 = 0 4 8 2 4

(5) 14.839 x 1.2 = 1 7 8 0 6 8

(6) 361.4 x 3.54 = 1279356

(7) 219.241 x 2.5 = 5481025

(8) 402.58 x 2.3 = 925934

B. Solve:

(1) 0.28 x 0.4	(2) 0.45 x 0.5	(3) 0.2 x 0.023
(4) 0.28 x 0.05	(5) 0.065 x 0.25	(6) 0.005 x 0.12
(7) 0.002 x 0.08	(8) 0.105 x 0.09	(9) 0.31 x 0.052
(10) 0.22 x 0.057	(11) 0.25 x 0.05	(12) 0.755 x 0.14

C. Multiply:

(1) 1.4 x 2.5	(2) 1.05 x 2.6	(3) 3.8 x 0.7
(4) 0.3 x 2.01	(5) 4.45 x 1.8	(6) 8.84 x 1.5
(7) 6.24 x 7.1	(8) 5.25 x 4.4	(9) 7.05 x 2.6
(10) 9.06 x 5.5	(11) 25.08 x 8.5	(12) 9.2 x 7.85

Divide a decimal by a decimal (by converting decimals to fractions)

Let us consider the following examples:

Example 1. Solve: 2.48 ÷ 1.24

Solution:

$$2.48 \div 1.24 = \frac{248}{100} \div \frac{124}{100}$$

$$= \frac{248}{100} \times \frac{100}{124}$$

$$= \frac{248 \times \cancel{100}^{1}}{\cancel{100}_{1} \times 124} = \frac{248}{124}$$

$$= \frac{\cancel{248}^{\cancel{124}^{\cancel{62}^{2}}}}{\cancel{124}_{\cancel{62}_{\cancel{31}_{1}}}} = 2$$

Thus, 2.48 ÷ 1.24 = **2**

Example 2: Solve: 1.84 ÷ 2.3

Solution:

$$1.84 \div 2.3 = \frac{184}{100} \div \frac{23}{10}$$

$$= \frac{184}{100} \times \frac{10}{23}$$

$$= \frac{\cancel{184}^{8} \times \cancel{10}^{1}}{\cancel{100}_{10} \times \cancel{23}_{1}}$$

$$= \frac{8}{10} = 0.8$$

Thus, 1.84 ÷ 2.3 = **0.8**

Example 3: Solve: 6.25 ÷ 0.25

Solution: $6.25 \div 0.25 = \frac{625}{100} \div \frac{25}{100}$

$= \frac{625}{100} \times \frac{100}{25} = \frac{625 \times \cancel{100}^{1}}{\cancel{100}_{1} \times 25}$

$= \frac{625}{25} = \frac{\cancel{625}^{25}}{\cancel{25}_{1}} = 25$

Thus 6.25 ÷ 0.25 = **25**

Divide a decimal by a decimal using direct division by moving decimal positions.

Consider the following examples:

Example:

Solve the following decimals using direct division method by moving decimal positions:

(i) 0.55 ÷ 0.05 (ii) 0.125 ÷ 0.5 (iii) 2.25 ÷ 0.3

Solutions:

(i) 0.55 ÷ 0.05 = 55 ÷ 5 = **11**

(Both the decimals are with two decimal places). So we get whole number.

$\frac{\cancel{0.55}^{11}}{\cancel{0.05}_{1}} = 11$

```
    11
5 ) 55
  – 55
     0
```

(ii) 0. 125 ÷ 0.5 = 1.25÷ 5

3 decimal places – 1 decimal place

= 2 decimal places

= **0.25**

$\frac{\cancel{.125}^{25}}{\cancel{.5}_{1}} = 0.25$

```
   0.25
5 ) 1.25
  – 10
     25
   – 25
      0
```

(iii) 2.25 ÷ 0.3 = 22.5 ÷ 3 = 7.5

4 decimal places – 1 decimal place

= 3 decimal places

$\frac{2.25}{0.3} = \frac{22.5}{3}$

$= 7.5$

EXERCISE 4.8

A. Solve by converting decimals to fractions:

(1) 2.16 ÷ 0.6	(2) 5.76 ÷ 0.24	(3) 4.41 ÷ 0.3
(4) 7.84 ÷ 0.07	(5) 0.6017 ÷ 1.1	(6) 4.905 ÷ 4.5
(7) 7.84 ÷ 0.14	(8) 78.4 ÷ 0.7	(9) 10.24 ÷ 0.08
(10) 3.5308 ÷ 0.13	(11) 97.578 ÷ 0.039	(12) 10.26 ÷ 0.18

B. Solve the following decimals using direct division method by moving decimal positions:

(1) 0.016 ÷ 0.2	(2) 0.18 ÷ 0.3	(3) 0.36 ÷ 0.6
(4) 0.072 ÷ 0.8	(5) 0.121 ÷ 1.1	(6) 0.0169 ÷ 1.3
(7) 0.96 ÷ 0.4	(8) 1.018 ÷ 0.9	(9) 0.036 ÷ 1.2
(10) 2.0289 ÷ 1.7	(11) 0.0144 ÷ 1.2	(12) 0.072 ÷ 0.12
(13) 4.096 ÷ 0.16	(14) 0.325 ÷ 0.25	(15) 0.0196 ÷ 1.4

Use division to change fractions into decimals

Consider the following examples:

Examples: Change the following fractions into decimals:

(i) $\frac{2}{5}$ (ii) $\frac{10}{6}$

Solution: (i) $\frac{2}{5} = 2 \div 5$

```
   0.4
5 ) 20
  – 20
  ----
     0
```

So, $= \frac{2}{5} = 0.4$

(ii) $\frac{10}{6} = 10 \div 6$

```
    1.66
6 ) 1000
  – 6
  ----
    40
  – 36
  ----
    40
  – 36
  ----
    04
```

Remainder → 04

So, $\frac{10}{6} = 1.66$

EXERCISE 4.9

1. Change the following fractions into decimals:

(1) $\frac{5}{4}$	(2) $\frac{5}{3}$	(3) $\frac{4}{5}$	(4) $\frac{7}{10}$	(5) $\frac{15}{7}$
(6) $\frac{14}{9}$	(7) $\frac{5}{8}$	(8) $\frac{23}{9}$	(9) $\frac{32}{7}$	(10) $\frac{45}{13}$
(11) $\frac{50}{15}$	(12) $\frac{9}{14}$	(13) $\frac{11}{16}$	(14) $\frac{5}{12}$	(15) $\frac{17}{20}$
(16) $\frac{125}{60}$	(17) $\frac{245}{26}$	(18) $\frac{250}{8}$	(19) $\frac{300}{250}$	(20) $\frac{23}{25}$

Simplify decimal expressions involving brackets (applying one or more basic operations)

Simplifying decimals is a common activity. Just need some care of positions of decimals. Decimal expressions involving multiple operations and brackets are simplified using the rules of BODMAS.

Example 1: Simplify: 24.24 – (5.6 + 20.25 – 4.45)

Solution: First solve the expressions in the bracket.

24.24 – (5.6 + 20.25 – 4.45)
= 24.24 – (25.85 – 4.45) (Operations of addition are performed, then subtraction in operations are performed)
= 24.24 – 21.40
= 2.84

Example 2. Simplify: 52.05 + (28.22 – 22.6) + (13.15 – 6.56)

Solution:

52.05 + (28.22 – 22.6) + (13.15 – 6.56) = 52.05 + 5.62 + 6.59
= 52.05 + 12.21
= 64.26

EXERCISE 4.10

Simplify:

(1) 5.6 + 7.22 – (2.24 + 4.68)

(2) (20.14 x 5.6) + 10.9335

(3) 4.6 + 6.07 + (23.35 – 8.30 + 8.34)

(4) 14.3 – 2.8 + (1.84 + 3.29)

(5) (5.24 + 2.02) – 0.96 – 7.45 + (9.405 – 2.24)

(6) 5.6 x (25.5 – 12.2) + (2.3 + 2.6)

(7) 45.234 + (18.024 – 6.66) – (0.457 + 9.945)

(8) 3.45 x 8.56 – 4.23 + (2.2 – 1.12)

(9) (6.6 x 3.59) – (1.12 + 0.1) – 1.02

(10) (230.24 + 23.028) – 72.72   (6.42 + (14.045 – 6.3)

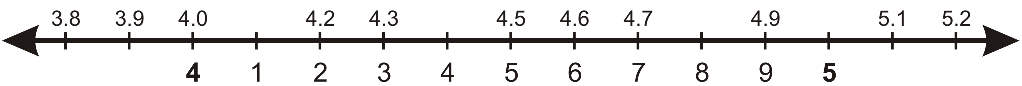
Round off decimals up to specific number of decimal places

Consider the following examples.

Example 1.

Round off the following decimals to the nearest whole number:

(i) 4.2   (ii) 4.5   (iii) 4.7



This is a number line, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 5.0, 5.1 and 5.2 are represented on it.

Solutions:

(i) 4.2

Look at the number line.

4.2 is closer to 4 than to 5; and 4.2 is nearest to 4.

So, 4.2 = 4.

(ii) 4.5
Look at the number line.
4.5 is equally closer to 4 and 5.
If it is = or > 5, round of the numbers accordingly.
So, 4.5 becomes 5 after rounded off.

(iii) 4.7
Look at the number line.
4.7 is closer to 5 than to 4; and 4.6 is nearest to 5.
So, 4.7 = 5.

Rule: In order to round off a decimal nearest to the whole number. (i) Check the first decimal place or tenths digit to see if it is less or greater than 5. (ii) If it is < 5, it will remain unchanged. (iii) If it is = or > 5, rounded off the numbers accordingly.

Example 2.

Round off the following decimal numbers up to the one decimal places:

(i) 24.33 (ii) 50.67 (iii) 50.94

Solutions:

(i) 24.33
24.33 is closer to 24.3 than to 24.4; and 24.33 is nearest to 24.3
So, 24.33 after rounded of up to one decimal place = 24.3

(ii) 50.67
50.67 is closer to 50.7 than to 50.6; and 50.67 is nearest to 50.7
So, 50.67 after rounded off up to one decimal place = 50.7

(iii) 50.94
50.94 is closer to 50.9 than to 51 and 50.94 is nearest to 50.9
So, 50.94 after rounded off up to one decimal place = 50.9

Example 3.

Round off the following decimal numbers up to the two decimal places:

(i) 9.354 (ii) 58.687

Solutions:

(i) **9.354**

9.354 is closer to 9.35 than to 9.36; and 9.354 is nearest to 9.35

So, 9.354 after rounded off up to two decimal places = 9.35

(ii) **58.687**

58.687 is closer to 58.69 than to 58.68; and 58.687 is nearest to 58.69

So, 58.687 after rounded off up to two decimal places = 58.69

EXERCISE 4.11

1. Round off the following decimals as whole numbers.

(1) 2.3	(2) 5.6	(3) 7.7	(4) 6.6
(5) 9.9	(6) 8.3	(7) 7.8	(8) 50.2
(9) 58.6	(10) 78.2	(11) 81.7	(12) 99.9

2. Round off the following decimals up to one decimal place.

(1) 32.38	(2) 25.156	(3) 6.17	(4) 6.42
(5) 76.798	(6) 95.24	(7) 12.86	(8) 5.95
(9) 3.432	(10) 11.7681	(11) 50.4752	(12) 60.1536

3. Round off the following decimals up to two decimal places.

(1) 32.386	(2) 25.056	(3) 6.775	(4) 6.422
(5) 76.798	(6) 8.4832	(7) 0.9627	(8) 58.1905
(9) 4.0098	(10) 40.9807	(11) 70.4908	(12) 19.0185

Convert fractions to decimals and vice versa

Consider the following examples:

Example 1. Convert the fraction $\frac{6}{10}$ into decimals.

Solution: $\frac{6}{10}$ = 6 tenths = 0.6

Example 2. Convert the fraction $\frac{2}{5}$ into decimals.

Solution:

$\frac{2}{5} = \frac{2 \times 2}{5 \times 2} = \frac{4}{10}$ (Multiply 2 by 2 and 5 by 2, we get the new fraction).

= 4 tenths = 0.4

Example 3. Convert the fraction $\frac{45}{1000}$ into decimals.

Solution: $\frac{45}{1000}$ = 45 Thousandths = 0.045

Let us convert the decimals 0.68 to a fraction

$$0.68 = \frac{0\,.\,6\,8}{1\,0\,0} = \frac{68}{100} = \frac{\overset{17}{\cancel{68}}}{\underset{25}{\cancel{100}}} = \frac{17}{25}$$

Remember: For the numerator, we write the given number without the decimal point.

For the denominator, we write 1 for the decimal point and put zeros after 1 according to the decimal places. Then simplify if possible.

Example 4: **Convert following decimals into fractions in their lowest form.**

(i) 0.8 (ii) 0.625

Solution:

(i) $0.8 = \frac{0.8}{10} = \frac{8}{10}$

$= \frac{\cancel{8}^{4}}{\cancel{10}_{5}} = \frac{4}{5}$

Thus $0.8 = \frac{4}{5}$

(ii) $0.625 = \frac{0.625}{1000}$

$= \frac{\cancel{625}\ \cancel{125}\ \cancel{25}\ 5}{\cancel{1000}\ \cancel{200}\ \cancel{40}\ 8} = \frac{5}{8}$

Thus $0.625 = \frac{5}{8}$

EXERCISE 4.12

A. Convert the following fractions into decimals:

(1) $\frac{7}{8}$ (2) $\frac{9}{10}$ (3) $\frac{2}{5}$ (4) $\frac{17}{25}$ (5) $\frac{61}{50}$

(6) $\frac{19}{20}$ (7) $\frac{49}{40}$ (8) $\frac{71}{80}$ (9) $\frac{451}{500}$ (10) $\frac{79}{250}$

(11) $\frac{83}{100}$ (12) $\frac{111}{400}$ (13) $\frac{777}{800}$ (14) $\frac{551}{1000}$ (15) $\frac{999}{10000}$

B. Convert the following decimals into fractions:

(1) 0.5 (2) 1.05 (3) 3.56 (4) 0.565

(5) 0.023 (6) 0.25 (7) 0.345 (8) 35.506

(9) 0.064 (10) 0.945 (11) 41.625 (12) 46.1024

Solve real life problems involving decimals

We have already learnt four operations on decimals. Now we will learn real life problems based on operations.

Example 1. Ahmed and Ali are two brothers, they saved Rs 1245.50 and Rs 1050.50 respectively. How much amount they saved altogether?

Solution:

$$\begin{array}{r} 1245.50 \\ +\ 1050.50 \\ \hline 2296.00 \\ \hline \end{array}$$

Ahmed saved money = Rs 1245.50

Ali saved money = Rs 1050.50

Both brothers saved = Rs 1245.50 + Rs 1050.50

= Rs 2296.00

Example 2. Price of 15 pencils is Rs 97.50. Find the price of one pencil.

Solution:

The price of 15 pencils is Rs 97.50

Therefore, the price of 1 pencil = 97.50   15

$$= \frac{9750}{100} \quad 15$$

$$= \frac{9750}{100} \times \frac{1}{15}$$

$$= \frac{\overset{65}{\cancel{975}}}{10 \times \underset{1}{\cancel{15}}} = \frac{65}{10}$$

$$= 6.50$$

Thus, price of one pencil is Rs 6.50

EXERCISE 4.13

(1) Sahir bought two chickens of weight 1.450 kg and other of 1.685 kg respectively. Find the total weight of both chicken.

(2) A general store sold 200.750 kg of flour and 98.500 kg of sugar. How much more flour was sold than sugar?

(3) Saira bought a necklace of gold of mass 2.565 g and bangles of mass 8.875 g. What is the total mass of these two items?

(4) Aftab saved Rs 3206.75 from monthly salary of Rs 35200. Find his monthly expenditure.

(5) Noor communications earn Rs 2345.75 in a day by selling easy loading balance. How much amount he will earn in one month?

(6) A bundle contains 119.5 m of wire. If one piece of wire measuring 29.92 m is sold. Find the length of remaining piece of wire.

(7) The height of a pole is 18.75 m. We have ladder of $\frac{1}{3}$ of pole. How much length is left out?

(8) A school uniform is made from 4.5 m cloth. How many uniforms can be made from 31.5 m cloth?

(9) A lady used 3.60 kg of salt in preparing different kinds of food for her family in a month. How much salt is used per day?

(10) The price of 2.5 kg ghee is Rs 391.25. Find the price of 1 kg.

4.2 PERCENTAGES

Recognize percentage as a special kind of fraction

The word “Percent” is formed of two words, “Per” and “Cent”. “Per” means out of and “Cent” means hundred. Therefore, the PERCENT is used for one hundred and represented by %.

1% makes $\frac{1}{100}$ means 1 out of 100 = 0.01

10 % makes $\frac{10}{100}$ means 10 out of 100 = 0.1

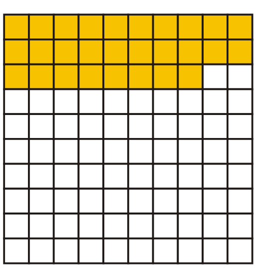
and 100% makes $\frac{100}{100}$ means 100 out of 100 = 1

Thus, percentage is a special kind of fraction.



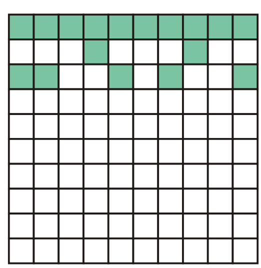
Express the shaded parts as percentages.

(i)

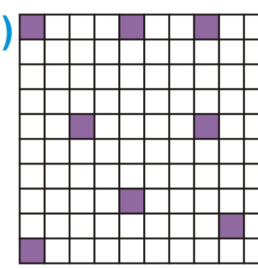


$\frac{28}{100}$ = 28%

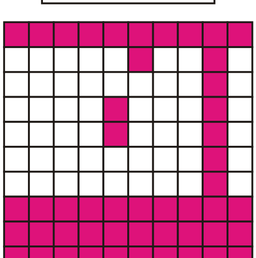
(ii)



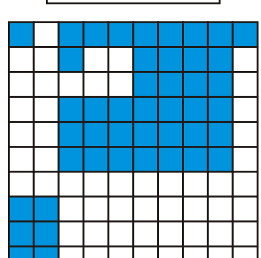
(iii)



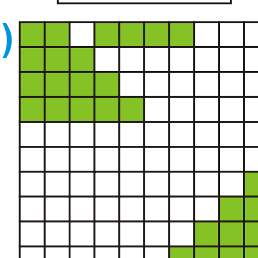
(iv)



(v)



(vi)



Teacher’s Note Teacher should explain the concept of percentage as a kind of fraction.

Convert percentage to fraction and to decimal and vice versa.

Consider the following examples:

Example 1. Convert the given percentages into fraction and then into decimal.

(i) 15% (ii) 75%

Solution:

(i) $15\% = \frac{15}{100} = \frac{\cancel{15}^{3}}{\cancel{100}_{20}} = \frac{3}{20}$, it is fractional form.

and $15\% = \frac{15}{100} = 0.15$, it is decimal form.

(ii) $75\% = \frac{75}{100} = \frac{3 \times \cancel{25}^{1}}{4 \times \cancel{25}_{1}} = \frac{3}{4}$, it is fractional form.

and $75\% = \frac{75}{100} = 0.75$, it is decimal form.

Example 2. Convert the given decimals into fraction and then convert into percentage:

(i) 0.50 (ii) 2.45

Solution:

(i) $0.50 = \frac{50}{100} = \frac{\cancel{50}^{1}}{\cancel{100}_{2}} = \frac{1}{2}$

Now, $0.50 = \frac{50}{100} = 50\ \%$

Thus $0.50 = \frac{1}{2}$ is in fractional form and $0.50 = 50\%$

(ii) $2.45 = \frac{245}{100} = \frac{49 \times \cancel{5}^{1}}{20 \times \cancel{5}_{1}}$

$= \frac{49}{20} = 2\frac{9}{20}$ (fractional form)

Now, $2.45 = \frac{245}{100} = 245\%$

Example 3. **Express the fraction $\frac{3}{5}$ as percentage.**

Solution: For making denominator 100 multiply 3 and 5 by 20, we get the equivalent fraction.

$$\frac{3 \times 20}{5 \times 20} = \frac{60}{100}$$

This means 60%. Hence, $\frac{3}{5} = 60\%$

EXERCISE 4.14

A. Convert the given percentages into fraction and then into decimal.

(1) 25%	(2) 30%	(3) 35%	(4) 40%
(5) 65%	(6) 70%	(7) 80%	(8) 85%
(9) 95%	(10) 99%	(11) 105%	(12) 115%

B. Convert the given decimals into fractions and then convert into percentage.

(1) 0.8	(2) 0.34	(3) 0.56	(4) 0.63
(5) 0.55	(6) 0.66	(7) 3.45	(8) 3.60
(9) 5.50	(10) 2.05	(11) 25.5	(12) 55.25

C. Express the following fractions as percentages, giving your answer correct to 1 decimal place where necessary.

(1) $\frac{4}{5}$	(2) $\frac{6}{25}$	(3) $\frac{11}{20}$	(4) $\frac{5}{8}$	(5) $\frac{17}{40}$
(6) $\frac{5}{12}$	(7) $\frac{19}{60}$	(8) $\frac{17}{30}$	(9) $\frac{71}{50}$	(10) $1\frac{4}{5}$

Solve real life problems involving percentages

Consider the following examples.

Example. There are 825 students studying in a school. 40 percent are girls. How many number of girls are studying in the school?

Solution:

Number of girls studying in the school = 40% of 825

$$= \frac{40}{100} \times 825 = 0.40 \times 825$$

$$= 330 \text{ girls}$$

Thus **330 girls** studying in the school.

EXERCISE 4.15

(1) 480 students visited a book fair. Out of them 45 percent are boys. How many boys visited the book fair?

(2) 825 students are studying in a school. 60 percent students were regular for whole of the session. How many students were regular in the school?

(3) 900 employees are in a company. 70 percent employees were using English frequently. How many employees are using English frequently?

(4) 65 percent of the houses in the colony have computers. There are 2450 houses in all. How many houses have computers?

(5) In a school total number of students are 1200. In class V have 20% of the students. How many students in class V?

(6) There are 450 cars are in a car parking and 20% of these are white in colour. What is the number of white cars?

(7) The original price of a dress is Rs 1650. During a sale, it is sold at 9% discount. What is the price of a dress?

REVIEW EXERCISE 4

A. Fill in the blanks.

(1) 42.0 ____________ = 0.42

(2) 12.04 x _____________ = 1204.

(3) In decimals 65% = _____________.

(4) 4 + 0.4 + 0.04 + 0.004 = _____________.

(5) When we round off 4.956 to two decimal places, we get _____________.

B. Solve:

(1) Arrange 0.016, 2.087, 1.995, 0.463 in ascending order.

(2) Solve: 9.123 – 5.865 + 2.403

(3) Height of an electric pole is 14.95 m and height of mobile tower is 25.04 m. How much higher is the mobile tower then electric pole?

(4) Verify: 4.5 x 3.2 = 45 x 0.32

(5) Divide 0.72 by 1.2

C. Solve the problems.

(1) 3.6 m cloth is required to make a dress. How many such dresses can be prepared from 14.4 m of cloth?

(2) Aftab gets 84% marks in all subjects of computer science. If the total marks are 2000. Find the marks he obtained.

(3) Find the value of:

(a) 3.5% of 450 (b) 0.45% of 760

(c) 110% of 220 (c) 1.1% of 1000

Unit 5

DISTANCE, TIME AND TEMPERATURE

5.1 DISTANCE

Convert kilometres to metres and metres to kilometres

We know the units of measuring length. Following is the table showing relationship among units of length.

10 millimetres (mm)	=	1 centimetre (cm)
100 centimetres (cm)	=	1 metre (m)
1000 metres (m)	=	1 kilometre (km)

Units of length can be converted.

It should be noted that when the bigger unit of lengths are converted into smaller units, we multiply the bigger units with their equivalent smaller units.

Similarly, when the smaller units are converted into bigger units, we divide the smaller units by the equivalent bigger units.

We already learnt to convert kilometres to metres, we multiply the number of kilometres by 1000.

Examples:

(1) Convert 5 km to metres

Solution:

Distance = 5 km

= (5 x 1000) m

= 5000 m

(2) Convert 8 km 150 m to metres

Solution:

Distance 8 km 150 m

= (8 x 1000) m + 150 m

= 8000 m + 150 m

= 8150 m

To convert metres to kilometres, we divide the number of metres by 1000.

Teacher's Note Teacher should explain the units of length and time. He/she should also revise the procedure of conversion into different units.

Examples.

(1) Convert 12000 m to km

Solution:

12000 m = (12000   1000) km

$= \frac{12\cancel{000}}{1\cancel{000}}$ km $= \frac{12}{1}$ km = 12 km

(2) Convert 18450 m to km and m

Solution:

18450 m = 18000 m + 450 m

$= \frac{18000}{1000}$ km + 450 m

= 18 km 450 m

```
        18 km
1000 ) 18450
      - 1000
        8450
        8000
         450 m
```

Convert metres to centimetres and centimetres to metres

We already learnt to convert metres to centimetres in previous class. We multiply the numbers of metres by 100.

Examples:

(1) Convert 11 m to cm

Solution:

11 m = (11 x 100) cm
= 1100 cm

(2) Convert 15 m 30 cm to cm

Solution:

15 m 30 cm
= (15 x 100) cm + 30 cm
= 1500 cm + 30 cm
= 1530 cm

To convert centimetres to metres, we divide the number of centimetres by 100.

Examples:

(1) Convert 1400 cm to m

Solution:

1400 cm = (1400   100) m

$$= \overset{14}{\cancel{1400}} \times \frac{1}{\underset{1}{\cancel{100}}} \text{ m} = 14 \text{ m}$$

(2) Convert 2436 cm to m and cm

Solution:

2436 cm = 2400 cm + 36 cm

= (2400   100) m + 36 cm

$$= \left(\overset{24}{\cancel{2400}} \times \frac{1}{\underset{1}{\cancel{100}}} \right) \text{ m} + 36 \text{ cm} = 24 \text{ m } 36 \text{ cm}$$

Convert centimetres to millimetres and millimetres to centimetres

We have already learnt about conversion of centimetres to millimetres, we multiply the number of centimetres by 10.

Examples.

(1) Convert 16 cm to mm

Solution:

16 cm = (16 x 10) mm

= 160 mm

(2) Convert 25 cm 4 mm to mm

Solution:

25 cm 4 mm

= 25 cm + 4 mm

= (25 x 10) mm + 4 mm

= 250 mm + 4 mm = 254 mm

To convert millimetres to centimetres, we divide the number of millimetres by 10.

Examples.

(3) Convert 350 mm to cm

Solution:

350 mm = (350   10) cm

$\left(35\cancel{0} \text{ x } \frac{1}{1\cancel{0}}\right)$ cm = 35 cm

(4) Convert 145 mm to cm and mm

Solution:

145 mm

= (145   10) cm

= 14.5 cm

= 14 cm 5 mm



Activity

Convert the following:

(1) 9 km = **9 x 1000 = 9000** m

(2) 2500 m = ________________ km

(3) 3784 m = ________________ km

(4) 3000 m = ________________ km

(5) 24 m = ________________ cm

(6) 350 cm = ________________ m

(7) 200 cm = ________________ m

(8) 4 m 58 cm = ______________ m

(9) 3 km 400 m = ____________ m

(10) 1320 cm = ______________ m

(11) 425 cm = ________________ m

(12) 250 mm = ______________ cm

(13) 500 mm = ______________ m

(14) 10 mm = ________________ cm

(15) 28 cm 5 mm = ___________ mm

EXERCISE 5.1

A. How many kilometres and metres?

(1) 1600 m (2) 2483 m (3) 1386 m
(4) 6034 m (5) 8324 m (6) 7945 m

B. Convert the lengths in metres and centimetres.

(1) 400 cm (2) 750 cm (3) 385 cm (4) 810 cm
(5) 205 cm (6) 567 cm (7) 684 cm (8) 998 cm

C. Convert into centimetres and millimetres.

(1) 35 mm (2) 634 mm (3) 593 mm (4) 400 mm
(5) 295 mm (6) 447 mm (7) 609 mm (8) 899 mm

D. Convert the following:

(1) 8 km to m
(2) 20 km 340 m to m
(3) 15 m to cm
(4) 25 m 45 cm to m
(5) 35 cm to mm
(6) 1200 m to km and m
(7) 3785 m to km and m
(8) 1520 cm to m and cm
(9) 850 mm to cm
(10) 4725 mm to cm and mm

E. How many metres?

(1) 7000 mm (2) 8000 mm (3) 9000 mm
(4) 4000 cm (5) 1000 cm (6) 5000 cm
(7) 6000 mm (8) 10000 cm

Add and subtract measure of distances

Example 1. **Add 3 m 35 cm distance to 8 m 75 cm.**

Solution:

	m	cm
	(1)	(1)
	3	35
+	8	75
	12	10

Therefore addition of distances:
3 m 35 cm + 8 m 75 cm = 12 m 10 cm

Example 2: **Subtract 4 m 80 cm from 11 m 15 cm distances**

Solution:

	m	cm
	10	(1)
	1~~1~~	15
–	4	80
	6	35

Therefore difference of distances:
11 m 15 cm – 4 m 80 cm = 6 m 35 cm

EXERCISE 5.2

A. Solve.

1. 43 km 15 m + 66 km 57 m
2. 428 m 15 cm + 257 m 29 cm
3. 5 km 860 m + 2 km 220 m
4. 8 m 70 cm + 5 m 60 cm
5. 3 km 918 m + 1 km 324 m
6. 45 cm 8 mm + 65 cm 7 mm
7. 8 km 750 m + 7 km 430 m
8. 9 m 58 cm + 4 m 64 cm

B. Subtract.

1. 12 km 75 m – 3 km 84 m
2. 143 m 62 cm – 87 m 59 cm
3. 8 km 546 m – 6 km 804 m
4. 51 cm 3 mm – 27 cm 8 mm
5. 5 km 150 m – 2 km 730 m
6. 71 m 22 cm – 48 m 85 cm
7. 7 km 505 m – 4 km 700 m
8. 23 cm 2 mm – 17 cm 9 mm

Solve real life problems involving conversion, addition and subtraction of units of distance

Example 1.

A carpenter needs 2 pieces of wood of 2 m 30 cm long and other is 70 cm. How much wooden piece he need altogether?

Solution:

	m	cm	
	(1) 2	30	
	+ 0	70	
Total length	3	00	(Would required is 3 m)

Example 2.

The length of an iron road is 9 m 80 cm. A piece of 5 m 85 cm has been cut off from it. How much length of iron rod is left?

Solution: Subtract 5 m 85 cm from 9 m 80 cm means 9 m 80 cm – 5 m 85 cm.

	m	cm
Length of iron road	9	80
Piece used	– 5	85
	3	95

Length of iron road left is **3 m 95 cm**

EXERCISE 5.3

Solve.

(1) The length of a ribbon is 6 m 80 cm. How much ribbon is left, if 2m 88 cm has been cut off?

(2) Jameel covered a distance of 589 m from his house to Jamia Masjid and then 868 m from Jamia Masjid to School. Find the total distance covered by him.

(3) A car is 1 m 62 cm wide. A garage is 2m 41 cm wide. How much space is left when the car is in the garage?

(4) Maria's home is distance as 375 m to the school. Railway station is 504 m far from her home. Which is farther from her home and how much?

(5) The red part of a colour pencil is 65 mm long. The blue part is 57 mm long. What is the length of pencil? What is the answer in millimetres and centimetres?

(6) In a walking race, in an specified time Hamid walked 2 km 102 m, Hussain walked only 1 km 985 m. How far ahead of Hussain was Hamid?

(7) In a 250 kilometre car race, a car get accident at a distance of 134 km from the winning point. What distance had the car drive before accident?

(8) Naeem is 142 cm tall. His friend is 8 cm taller than Naeem. How tall is his friend? Give the answer in metres.

5.2 TIME

Convert hours to minutes, minutes to seconds and vice versa



We already know the following relationship among various units of time.

60 seconds = 1 minute

60 minutes = 1 hour

To convert hours to minutes, we multiply the number of hours by 60.

Example: Convert 3 hours 20 minutes to minutes.

Solution: 3 hours 20 minutes

= 3 hours + 20 minutes = (3 x 60) minutes + 20 minutes

180 minutes + 20 minutes

= 200 minutes

To convert minutes into hours we divide the number of minutes by 60.

Examples:

(1) Convert 600 minutes to hours

Solution:

600 minutes

600 60 hours

= 10 hours

(2) Convert 400 minutes to hours and minutes

Solution:

400 minutes

= (400 60) hours

= 6 hours 40 minutes

$$\begin{array}{r} 6 \\ 60\overline{)\,400} \\ -\,360 \\ \hline 40 \end{array}$$

To convert minutes to seconds, we multiply the number of minutes by 60.

Examples:

(1) Convert 5 minutes 30 seconds to seconds

Solution: Given:

5 minutes 30 seconds

= 5 minutes + 30 seconds

= 5 x 60 seconds + 30 seconds

= 300 seconds + 30 seconds

= 330 seconds

(2) Convert 12 minutes 45 seconds to seconds

Solution: Given:

12 minutes 45 seconds

= 12 minutes + 45 seconds

= 12 x 60 seconds + 45 seconds

= 720 seconds + 45 seconds

= 765 seconds

To convert seconds to minutes, we divide the number of seconds by 60.

Example. Convert 660 seconds into minutes

Solution: Given 660 seconds

= (660 60) minutes.

= 11 minutes



Convert 2 days into hours, minutes and seconds.

2 days = (2 x 24) hours = _________ hours

48 hour = 48 x 60 minutes = _________ minutes

2880 minutes = 2880 x 60 seconds = ________ seconds

EXERCISE 5.4

A. Convert into minutes.

(1) 2 hours
(2) 8 hours
(3) 12 hours
(4) 1 day 3 hours
(5) 1 day 6 hours
(6) 1 day 10 hours

B. Convert into seconds.

(1) 5 minutes
(2) 10 minutes
(3) 20 minutes
(4) 45 minutes
(5) 55 minutes
(6) 1 hour
(7) 1 hour 15 minutes
(8) 1 hour 25 minutes

C. Convert into hours and minutes.

(1) 1180 minutes
(2) 1250 minutes
(3) 1490 minutes
(4) 2225 minutes
(5) 1815 minutes
(6) 2375 minutes

D. Convert into minutes and seconds.

(1) 2185 seconds
(2) 275 seconds
(3) 350 seconds
(4) 710 seconds
(5) 990 seconds
(6) 1395 seconds

E. Convert into hours, minutes and seconds.

(1) 3800 seconds
(2) 4100 seconds
(3) 4360 seconds
(4) 4595 seconds
(5) 4725 seconds
(6) 4915 seconds

Addition and subtraction of units of time with carrying/borrowing

Example 1. Add 3 hours 55 minutes and 5 hours 40 minutes.

Solution: We add 3 hours 55 minutes and 5 hours 40 minutes.

	h	m
	(1) 3	55
+	5	40
	9	35

55 minute + 40 minute = 95 minutes
= 1 hour 35 minute
Write 35 minutes under minutes column and carry 1 to hours column.
Thus, 9 hours 35 minutes

Example 2. Subtract 58 minutes 15 seconds from 72 minutes 30 seconds

Solution: We subtract 58 minutes 15 seconds from 72 minutes 30 seconds.

	m	s
	(6) 7 (1) 2	(10) 15
–	5 8	30
	1 3	45

15 seconds – 30 seconds
We borrow 1 minute = 60 seconds
So, 60 + 15 = 75 seconds
75 – 30 = 45 seconds
Thus, 13 minutes 45 seconds

EXERCISE 5.5

A. Add.

(1) 30 minutes 38 seconds and 20 minutes 42 seconds.
(2) 47 minutes 25 seconds and 19 minutes 49 seconds.
(3) 4 hours 40 minutes and 3 hours 57 minutes.
(4) 3 hours 35 minutes 26 seconds and 2 hours 40 minutes 50 seconds.
(5) 2 hours 55 minutes 45 seconds and 3 hours 48 minutes 44 seconds.

B. Subtract.

(1) 38 minutes 39 seconds from 62 minutes 20 seconds.
(2) 44 minutes 25 seconds from 50 minutes.
(3) 2 hours 58 minutes from 3 hours 5 minutes
(4) 4 hours 32 minutes from 7 hours.
(5) 3 hours 45 minutes 50 seconds from 5 hours 30 minutes 40 seconds.

Convert years to months, months to days, weeks to days and vice versa

We already know that:

24 hours	**=**	**1 day**
7 days	**=**	**1 week**
4 weeks	**=**	**1 month**
1 month	**=**	**30 days**
12 months	**=**	**1 year**
365 days	**=**	**1 year**

A. Convert years to month and months to year

To convert years into months, we multiply the number of years by 12.

Example.

(a) Convert 11 years to months
(b) Convert 5 years 10 months to months

Solution:

(a) 11 years = (11 x 12) months = 132 months

(b) 5 years 10 months = 5 years + 10 months
= (5 x 12) months + 10 months
= 60 months + 10 months
= 70 months

Teacher's Note Teacher should explain the students method of conversion of years to months, months to days, week to days and vice versa and give them more task.

B. Convert months to years

To convert months to years, we divide the number of months by 12.

Example.

(a) Convert 48 months to years
(b) Convert 81 months to years and months

Solution:

(a) 48 months = (48 12) years = 4 years

(b) 81 months = (81 12) years = (72 12) years+9 months
= 6 years 9 months

C. Convert months to days

To convert months to days, we multiply the number of months by 30.

Example .

(a) Convert 18 months to days
(b) Convert 13 months 25 days to days

Solution:

(a) 18 months = 18 x 30 days = 540 days

(b) 13 months 25 days = 13 months + 25 days
= (13 x 30) days + 25 days
= 390 days + 25 days = 415 days

D. Convert days to months

To convert days to months, we divide the number of days by 30.

Example.

(a) Convert 150 days to months
(b) Convert 244 days to months and days

Solution:

(a) 150 days = (150 days 30) months = 5 months

(b) 244 days = (244 30) months
= (240 30) months + 4 days
= 8 months 4 days

E. Convert weeks to days

To convert weeks to days, we multiply the number of weeks by 7.

Example.

(a) Convert 4 weeks to days
(b) Convert 14 weeks 2 days to days

Solution:

(a) 4 weeks = 4 x 7 days = 28 days

(b) 14 weeks 2 days = 14 weeks + 2 days
= (14 x 7) days + 2 days
= 98 days + 2 days = 100 days

F. Convert days to weeks

To convert days into weeks, we divide the number of days by 7.

Example.

(a) Convert 98 days to weeks
(b) Convert 125 days to weeks and days

$$\begin{array}{r} 17 \\ 7\overline{)125} \\ -7 \\ \hline 55 \\ -49 \\ \hline 6 \end{array}$$

Solution:

(a) 98 days = (98   7) weeks = 14 week

(b) 125 days = (125   7) weeks
(Divide 125   7, we get 17 weeks and remainder 6 days)
= 17 weeks 6 days

EXERCISE 5.6

Convert:

(1) 46 days into weeks and days.
(2) 80 days into weeks and days.
(3) 213 days into weeks and days.
(4) 2343 days into weeks and days.
(5) 450 days into months and days.

(6) 800 days into months and days.
(7) 710 days into months and days.
(8) 650 days into months and days.
(9) 66 months into years and months.
(10) 82 months into years and months.
(11) 49 months into years and months.
(12) 244 months into years and months.

Solve real life problems involving conversion, addition and subtraction of units of time.

Example 1. Sana is 12 years 8 months old and her sister Saba is 6 years 10 months old. How much older is Sana than her sister?

Solution: We have subtract age of Saba and Sana.

	Years	Months
	~~1~~ 1	(12)
Sana's age	~~12~~	8
Saba's age	− 6	10
	5	10

First we borrow 1 year = 12 months by adding 12 months + 8 months = 20 months
Now 20 – 10 months
Write 10 below months column.

Sana is 5 years and 10 months older than her sister Saba.

Example 2. The school opens at 7:30 a.m and closes at 1:15 p.m. How much time the school remains open?

Solution:

Duration from 7:30 a.m to 12:00 noon = 4 hours 30 minutes

Duration from 12:00 noon to 1:15 p.m = 1 hour 15 minutes

Now,

	Hours	Minutes
	4	30
+	1	15
	5	45

School duration is 5 Hours and 45 minutes.

EXERCISE 5.7

1. Umair plays for 1 hour 15 minutes and Ali plays for 55 minutes. Who plays for shorter period and how much?
2. Fatima takes 1 hour 20 minutes to complete her Mathematics homework and 50 minutes to complete her English homework. How much total time she takes to complete the homework of both subjects?
3. School closes for summer vacations for a period of 2 months and 5 days, while the other holidays are for 27 days. How many days school will remain closed?
4. At a library Hassan reads a newspaper for 36 minutes and then reads a magazine for 1 hour 50 minutes. How long does he spend in reading?
5. Adil takes 2 hours 9 minutes to complete a video gam, while Ali takes 55 minutes to complete the same game. How much more time Adil takes as compared to Ali?

5.3 TEMPERATURE

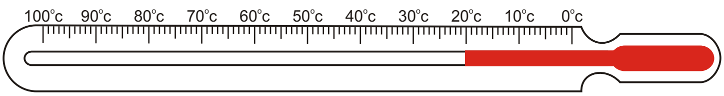
Recognize scales of temperature in Fahrenheit and Celsius

The instrument used to measure temperature is called thermometer.

There are two types of scales used in thermometers.

1. **Celsius scale** 2. **Fahrenheit scale**

Celsius scale

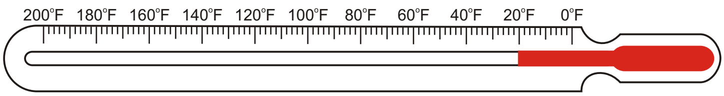


Celsius scale

The freezing point of water is zero degrees Celsius (0°C) and the boiling point of water is 100°C on the Celsius scale. The scale is divided into 100 equal parts. This scale is named after the Swedish Astronomer Celsius scale and is used in most parts of the world.

Teacher's Note Teacher should explain the concept of temperature and give knowledge about different scales of temperature.

Fahrenheit scale



Fahrenheit scale

The freezing point of water is 32 degrees Fahrenheit (32°F) and the boiling point of water is 212°F on the Fahrenheit scale, the scale is divided into 180 equal parts. This scale is named after the German scientist G. Fahrenheit.

(i) Converting temperature from Fahrenheit scale to Celsius scale

To convert temperature from Fahrenheit to Celsius scale, we subtract 32 and then multiply the difference by $\frac{5}{9}$.

Example: Change 59°F to the Celsius scale.

Solution:

Step 1: Subtraction of 32 from 59 gives

$59 - 32 = 27$

Step 2: Multiplication of 27 by $\frac{5}{9}$ gives

$\overset{3}{\cancel{27}} \times \frac{5}{\cancel{9}} = 3 \times 5 = 15$

Thus, 59°F = 15°C.

(ii) Converting from Celsius scale to Fahrenheit scale

To convert the temperature from Celsius scale to the Fahrenheit scale, we multiply given temperature by $\frac{9}{5}$ and add 32 to the product.

Example: **Change 35°C to the Fahrenheit scale.**

Solution:

Step 1: Multiplication of given temperature by $\frac{9}{5}$ gives

$$35 \times \frac{9}{5} = 7 \times 9 = 63$$

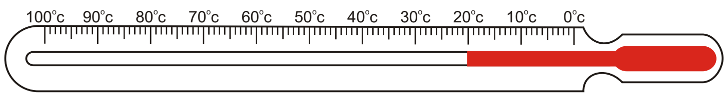
Step 2: Addition of 32 and 63 gives

$$63 + 32 = 95$$

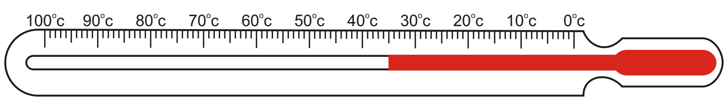
Thus, 35°C = 95°F.

EXERCISE 5.8

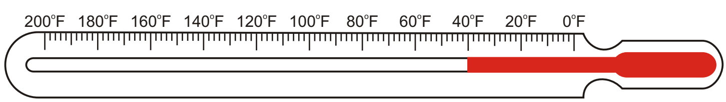
A. Write the readings from following thermometer.

(1) 

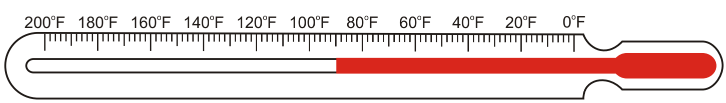
______°C

(2) 

______°C

(3) 

______°F

(4) 

______°F

B. Change to the Celsius scale:

(1) 41°F	(2) 77°F	(3) 95°F	(4) 68°F
(5) 203°F	(6) 230°F	(7) 257°F	(8) 275°F
(9) 122°F	(10) 167°F	(11) 230°F	(12) 248°F

C. Change to the Fahrenheit scale:

(1)	30°C	(2)	45°C	(3)	85°C	(4)	55°C	(5)	90°C
(6)	10°C	(7)	20°C	(8)	60°C	(9)	80°C	(10)	110°C

Solve real life problems involving conversion, addition and subtraction of units of temperature

Example:

In the month of May on one day the maximum temperature in Larkana was 113°F. What was the temperature in degree Celsius?

Solution: Temperature in Larkana was 113°F

Subtracting 32 from 113 gives: 113 – 32 = 81

Multiplication of 81 by $\frac{5}{9}$ gives: $81 \times \frac{5}{9} = \frac{\overset{9}{\cancel{81}} \times 5}{\cancel{9}} = 45$

Thus, temperature in Celsius was 45°C

EXERCISE 5.9

(1) Day the maximum temperature on a day in Hyderabad was 35°C. What was the temperature in degree Fahrenheit?

(2) During summer on one day the temperature in Jacobabad was 113°F where as the temperature in Hyderabad was 40°C. Which city had more temperature and how much?

(3) Ali was suffering from fever. His temperature at noon was 102°F. Convert the said temperature into degree Celsius.

(4) In summer on one day the maximum temperature in Sukkur was 104°F, where as in Karachi it was 35°C What was the difference in the temperatures of both the cities in degree Fahrenheit?

(5) Day the maximum temperature on a day in Sehwan Sharif was 86°F. The minimum temperature on that day was 20°C. What was the difference in the both temperatures in degree Fahrenheit?

REVIEW EXERCISE 5

1. Convert:

(i) 28km 648m to m (ii) 48m 97cm to cm

(iii) 76cm 9mm to mm (iv) 6m 75cm 8mm to mm

2. Add:

(i) 38 minutes 42 seconds and 25 minutes 55 seconds

(ii) 20 hours 30 minutes and 16 hours 43 minutes

(iii) 4m 70cm 9mm and 3m 80cm 5mm

3. Subtract:

(i) 22km 895m from 67km 472m

(ii) 2m 85cm 8mm from 4m 13cm 2mm

(iii) 39 hours 49 minutes from 76 hours 32 minutes

4. Choose the correct answer:

(i) 5 km =

(a) 500 m (b) 5000 m (c) 50 m (d) 555 m

(ii) 3 metres =

(a) 30 cm (b) 300 cm (c) 3000 cm (d) 30000 cm

(iii) 6 weeks =

(a) 40 days (b) 35 days (c) 30 days (d) 42 days

(iv) 69°F = _____°C

(a) 20 (b) 25 (c) 30 (d) 35

5. What will be the time?

(i) 50 minutes earlier than 13 : 25

(ii) 45 minutes later than 9 : 45

6. How much time?

(i) 5 : 30 to 6 : 15 (ii) 2 : 20 to 3 : 25

UNITARY METHOD

6.1 UNITARY METHOD

Describe the concept of unitary method

We use mathematics in our daily life problems, in which the price of a number of articles is given. We are required to find the price of some other number of articles of same kind. We solve such problems by finding the price of one article.

The method in which the value of a number of articles as unit is determined by finding a value of an article is called unitary method.

Calculate the value of many objects of the same kind when the value of one of these objects is given

Case I:

To find the value of many objects we just multiply the value of one object with required number of objects.

Example 1.

The price of a book is **Rs 30**. Find the price of **4** such books.

Solution:

The price of one book = 30 rupees
The price of 4 such books = (30 x 4) rupees
= 120 rupees

Example 2. The price of one pencil is **Rs 4.50**. What is the price of **5** such pencils?

Solution:

The price of 1 pencil = 4.50 rupees
The price of 5 such pencils = (4.50 x 5) rupees
= 22.50 rupees

Case II:

To find the value of one object when the value of many objects is given, we divide the given value of the objects by the number of objects.

Teacher's Note Teacher should explain the concept and gives the daily life problems regarding unitary method.

Example 3.

The price of **6 kg** apples is **Rs 240**. What is the price of **1 kg** apples?

Solution:

The price of 6 kg apples = 240 rupees

The price of 1 kg apples $= \frac{240}{6}$ rupees $= \frac{\cancel{240}^{40}}{\cancel{6}_{1}}$ rupees

= 40 rupees

EXERCISE 6.1

1. The price of a pen is **Rs 30**. Find the price of **6** such pens.
2. One litre of petrol price is **Rs 105.70**. What is the price of **5 litres** of petrol?
3. The price of 1 kg rice is **Rs 110**. What is the price of **7 kg** rice?
4. The rent of a house for one month is **Rs 5000**. What is the rent for one year?
5. The price of a dozen bananas is **Rs 66**. What is the price of 1 banana?
6. If **12** books price **Rs 480**. What is the price of one book?
7. The price of **8** chocolates is Rs **36**. What is the price of one chocolate?
8. The price of ten balls is Rs **205**. What is the price of one ball?
9. The price of three mobile phones is Rs **38400**. What is the price of one?
10. The price of **16** pairs of socks is Rs **1004.50**. What is the price of one pair of socks?

Calculate the value of a number of same type of objects when the value of another of the same type is given (unitary method).

If value of many things is given. First we find the value of one thing and then find the value of the required number of things.

Example 1.

Rafay purchased **5** copies for **Rs 100**. How much will he pay for **12** such copies?

Solution:

The price of 5 copies = Rs 100

The price of 1 copy = Rs $\frac{100}{5}$

The price of 12 copies = Rs $\left(\frac{\overset{20}{\cancel{100}}}{\underset{1}{\cancel{5}}} \times 12\right)$

= Rs (20 x 12)

= Rs 240

Hence Rafay will pay Rs 240 for purchasing 12 such copies.

Example 2.

Bismah reads **50** pages of a book in **3** hours. In how many hours can she read the book of **250** pages?

Solution:

For reading 50 pages, she takes = 3 hours

For reading of 1 page, she will take = $\frac{3}{50}$ hours

For 250 pages, she takes = $\left(\frac{3}{\underset{1}{\cancel{50}}} \times \overset{5}{\cancel{250}}\right)$ hours

= (3 x 5) hours **= 15 hours**

So, Bismah can read the book in **15 hours**.

EXERCISE 6.2

1. The price of **6** balls is **240** rupees. Find the price of **10** such balls.

2. The cost of **10** books is **Rs 240**. What will be the cost of such **15** books?

3. The price of **2** dozen pencils is **Rs 60**. What is the price of $3\frac{1}{2}$ dozen pencils?

4. **6** farmers plough a field in **10** hours. How many hours will it take for **8** farmers to plough the same field?

5. Rent of a house for **3** months is **Rs 18000**. What is the rent for **8** months?

6. A car travels **45 km** in $3\frac{1}{2}$ **litres** of petrol. How far would it travel with **364 litres** of petrol?

7. **6** metres of cloth is required for **2** shirts. How many shirts can be made form **42** metre?

8. **12** coaches of passengers carry **624** persons. How many passengers will be carried by **18** such coaches?

9. The weight of **16** bags of rice is **775.60** kg. What will be the weight of **24** such bags?

10. The bus fare of **10** persons from Karachi to Larkana is Rs **8300**. What is the fare for 36 persons?

6.2 DIRECT AND INVERSE PROPORTION

Define ratio of two numbers

Ratio:

A ratio is a relationship between two numbers. The numbers represent quantities of same kind. Ratio of two numbers 3 and 2 is expressed as 3 : 2 or $\frac{3}{2}$ We read 3 : 2 as (3 is to 2)

> **Note:** Ratio compares two quantities of same kind.

For example: The ratio of ages of Danish and Rafay is 3 : 1 then it shows that

- Danish is older than Rafay
- Danish is thrice as old as Rafay

The ratio of two quantities a and b is written as a: b, read as "a is to b" a: b is also written as $\frac{a}{b}$, where b   0.

Proportion:

Equality of two ratios is called proportion. The symbol for proportions is "=" or " "

If a:b and c:d are two ratios then the proportion between these two ratios is written as:

a:b = c:d or a:b   c:d.

It is read as "Ratio a is to b is same as c is to d". Here a, b, c and d are respectively called as first term, second term, third term and four term of the proportion.

Example. 2 : 3 = 4 : 6 is a proportion.
We can write is as 2 3   4 6

Types of proportion:

There are two types of proportion.

(i) Direct proportion
(ii) Inverse proportion

Teacher's Note Teacher should explain the concept of ratio also describe the types of proportion with daily life examples.

(i) Direct Proportion: If two quantities are related in such a way that if one quantity increases in a given ratio, the other also increases in the same ratio or if one decreases in a given ratio, the other also decreases in the same ratio. Then the given quantities are said to be in direct proportion.

Examples:

(1) More money and more shopping; less money and less shopping.

(2) Faster the speed of machine and more production is produced.

(ii) Inverse Proportion: If two quantities are related in such a way that if one quantity increases in a given ratio, the other decreases in the same ratio. Then the given quantities are said to be inverse proportion.

Examples:

(1) Faster the speed, lesser the time taken

(2) More workers, less number of days for completing a work.



Identify and write direct or inverse proportion.

(i) More crowd, more noise. (Direct proportion)

(ii) More books, more money. (............................)

(iii) Less labourers, more time to build a house. (..................)

(iv) Less money, less toffees purchased. (............................)

Solve real life problems involving direct and inverse proportion (by unitary method)

Example 1. A man buys **3kg** of apples for **Rs 150**. How much will he pay for **7kg** of apples?

Solution:

Kg	Rs	Kg	Rs
3	150	7	☐

For 3kg of apples he spends Rs 150

For 1kg of apples he spends Rs $\frac{150}{3}$

For 7kg of apples he spends Rs $\frac{\cancel{150}^{50}}{\cancel{3}_{1}} \times 7$ **= Rs 350**

Example 2.

8 workers can do a work in **6** hours. How much time will **12** workers take to do the same work?

Solution:

Workers	Hours	Workers	Hours
8	6	12	☐

8 workers can do the work in = 6 hours

1 worker can do the work in = 6 x 8 hours (Less workers more time)

12 workers can do the work in $\frac{\overset{1}{\cancel{6}} \times \overset{4}{\cancel{8}}}{\underset{\underset{1}{\cancel{2}}}{\cancel{12}}}$ hours $= \frac{4}{1}$

(More workers less time) **= 4 hours**

So, **12 workers** will do the same work in **4 hours**.

EXERCISE 6.3

1. **The ratio of pocket money of Bismah and Omaima is 3 : 5. Write true of False.**
   - (i) Omaima has less pocket money than Bismah. (   )
   - (ii) Bismah has less pocket money than Umaima. (   )
2. **Express the following as ratio.**
   - (i) 3 boys to 6 girls
   - (ii) 25 minutes to 80 minutes
   - (iii) 5 days to 3 weeks
   - (iv) 250 kg to $1\frac{1}{2}$ kg
3. **Identify and write direct or inverse proportion.**
   - (i) More laboures, more work. (   )
   - (ii) More laboures, less days. (   )
   - (iii) Less speed of a car, more time taken. (   )
   - (iv) More farmers, more work done in the field. (   )

4. If 2 pack of juices cost is **Rs 24**. What is the cost of **4** pack of juices?
5. Aslam can walk **10.5 km** in **2** hours. Find the distance he can travel in **5** hours.
6. If **9** workers can complete a work in **6** days. How many workers are required to complete the same work in **3** days?
7. A motorcycle covers **100 km** in $2\frac{1}{2}$ litres of petorl. How many litres of petrol will it cover **300 km**?
8. **180** soldiers have food stock for **6** days. How many soldiers can eat the same food for **9** days?
9. **44** farmers could reap a field in **15** days. How many farmers can reap the same field in **10** days?

REVIEW EXERCISE 6

1. The cost of a sharpener is Rs. 4.50. Find the cost of a dozen sharpeners.
2. From Karachi to Nawabshah the fare of 10 persons in a bus is 6500 rupees. What is the fare of each person?
3. The cost of 2 dozen eggs is 220 rupees. What is the cost of 3 dozen eggs?
4. If 10 persons can do a work in 6 days. In how many days can 15 persons do the same work?
5. The price of 6 packets of chalk is Rs. 90. What is the price of 8 packets of chalk?
6. A printer prints 7620 papers in 1 hour. Find how many papers will be printed by the same printer in 40 minutes?
7. A train travels 800 km in 6 hours. How much distance will be traveled in 15 hours with same speed?

Unit 7

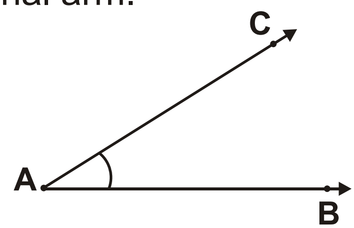
GEOMETRY

7.1 ANGLES

Recall an angle and recognize acute, right, obtuse, straight and reflex angle.

We know when two rays $\overrightarrow{AB}$ and $\overrightarrow{AC}$ meet at common end point, they form an angle.

Point A is called its vertex. $\overrightarrow{AB}$ and $\overrightarrow{AC}$ are called its arms or sides. $\overrightarrow{AB}$ is initial arm and $\overrightarrow{AC}$ is terminal arm.



It is named as angle BAC or angle CAB.

"   " is the symbol for an angle.

It is written as   BAC or   CAB.

It is readed as angle BAC or angle CAB.

7.1.1 Kinds of an Angle

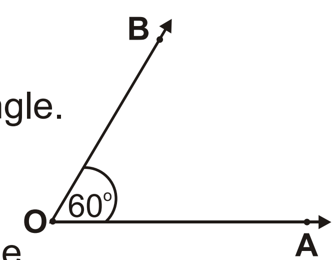
(i) Acute angle:

An angle whose measure is less than 90° is called an acute angle.

Here *m*   AOB = 60°

(*m* stands for measure)

Therefore   AOB is an acute angle.

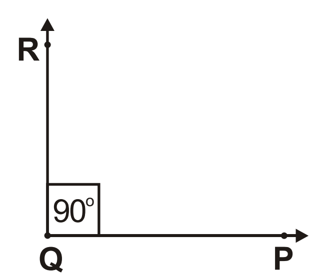


(ii) Right angle:

An angle whose measure is 90°, is called right angle.

Here *m*   PQR = 90°

Therefore   PQR is a right angle.



Teacher's Note

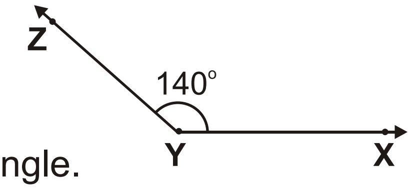
Teacher should revise and recall the students acute, right, obtuse, straight and reflex angle through making with paper or rope.

(iii) Obtuse angle:

An angle whose measure is greater than 90° but less than 180° is called an obtuse angle.

Here *m* XYZ = 140°

Therefore XYZ is an obtuse angle.

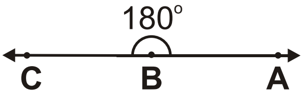


(iv) Straight angle:

An angle whose measure is 180° is called a straight angle.

Here *m* ABC = 180°

Therefore ABC is a straight angle.

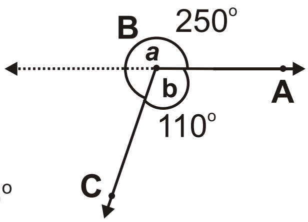


(v) Reflex angle:

An angle whose measure is greater than 180° but less than 360° is called a reflex angle.

In the given figure *m* ABC = *a* = 250°

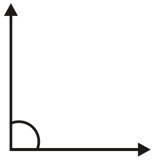
Therefore ABC is a reflex angle.



EXERCISE 7.1

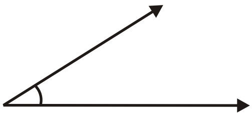
1. Name the angles then write their measurements.

(a)



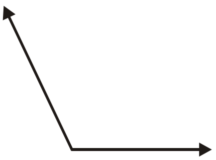
....

(b)



....

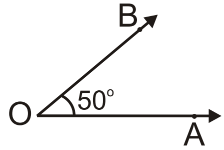
(c)



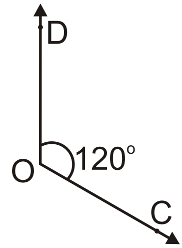
....

2. Identify the angles as acute, right, obtuse, straight or reflex angle.

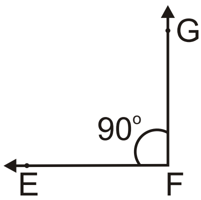
(a)



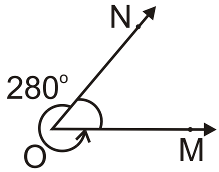
(b)



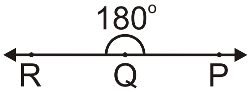
(c)



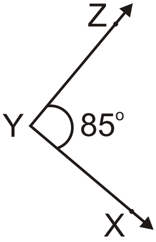
(d)



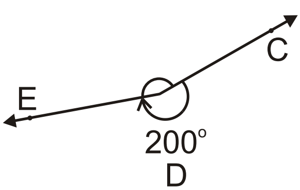
(e)



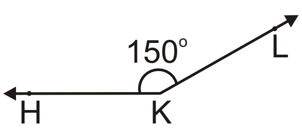
(f)



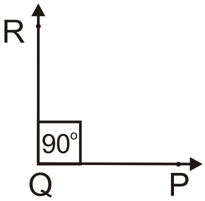
(g)



(h)



(i)

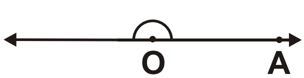


Use protractor to construct a right angle, a straight angle and reflex angles of different measure.

1. To construct a right angle with the help of protractor.

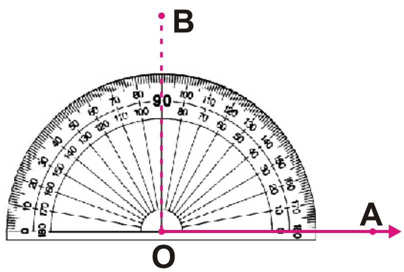
Steps of construction:

(i) Draw a $\overrightarrow{OA}$.

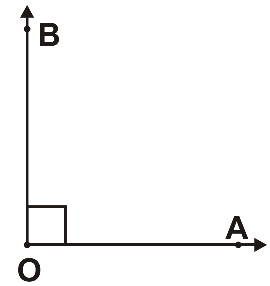


(ii) Place the centre point of the protractor at point O along $\overrightarrow{OA}$.

(iii) Read the measurement at the protractor from the side where its zero mark lies on $\overrightarrow{OA}$. Mark the point B at 90°.



(iv) Draw $\overrightarrow{OB}$ as shown in the picture.
Thus m AOB = 90° and it is the required right angle.

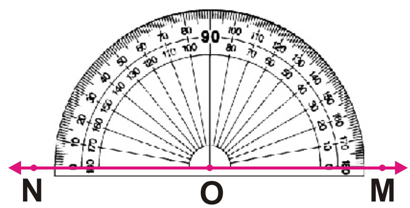


2. To construct a straight angle with the help of protractor.

Steps of construction:

(i) Draw a ray $\overrightarrow{OM}$.

(ii) Place the centre point of the protractor on point O along $\overrightarrow{OM}$.



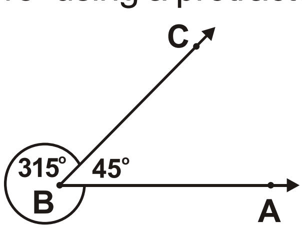
(iii) Read the protractor from the side where its zero mark lies on $\overrightarrow{OM}$. Mark a point N at 180°.

(iv) Now draw $\overrightarrow{ON}$ as shown in the picture.
Thus m MON = 180° which is the required straight angle.

3. Using the protractor to construct reflex angle of different measures.

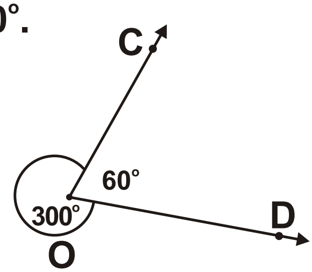
Steps of construction:

Let us draw and measure a reflex angle of 315° using a protractor.
We know that one complete turn = 360°.
Therefore the measure of
reflex ABC = $360^\circ - 45^\circ = 315^\circ$.
We first draw and measure the
acute ABC = 45°.



Teacher's Note Teacher should help students to draw different angles step by step.

Example. Construct a reflex angle of 300°.



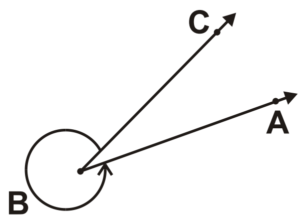
Steps of construction:

We subtract the given measure of 300° from 360° i.e. 360° – 300° = 60°. Now we draw an acute angle of 60° as to get the required reflex angle of 300°. COD is the required reflex angle. In this way we can draw a reflex angle of different measure.

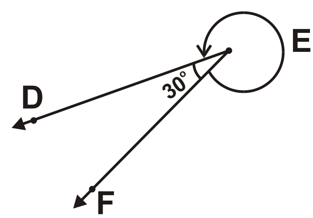
EXERCISE 7.2

1. Measure the reflex angles by using protractor.

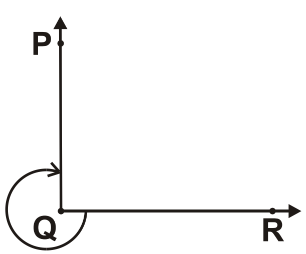
(i)



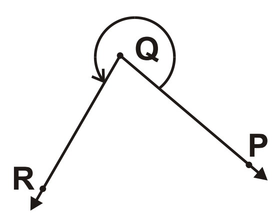
(ii)



(iii)



(iv)



2. Draw and label the following angles:

(i) ABC (reflex angle) (ii) DEF (straight angle)
(iii) GHI (reflex angle) (iv) PQR (right angle)
(v) STU (straight angle) (vi) XYZ (reflex angle)

3. Using protractor, draw the following:

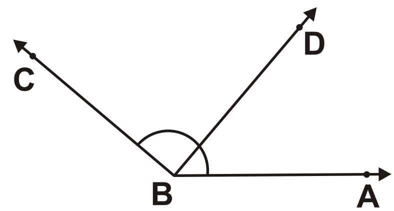
(i) Reflex ABC of 310° (ii) Reflex DEF of 280°
(iii) Reflex LMN of 340° (iv) Reflex OPQ of 290°

Describe Adjacent, Complementary and Supplementary angles

We often come across pairs of angles that have some special properties. Some of them are given below:

(i) Adjacent Angles

Look at the figure. We have two angles: (i) ABD and (ii) DBC. There is a common vertex at point B and a common arm $\overrightarrow{BD}$. The other two arms $\overrightarrow{BA}$ and $\overrightarrow{BC}$ of the angles are on the opposite sides of the common arm $\overrightarrow{BD}$.

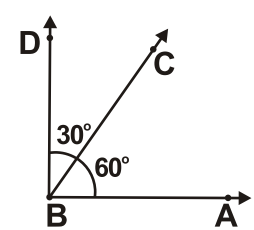


Two such angles: ABD and DBC are called adjacent angles.

> Thus two angles are said to be adjacent angles, if they have vertex, a common arm.

(ii) Complementary Angles

Two angles whose measures have a sum of 90°, are called complementary angles. In figure 60° and 30° are two complimentary angles because m ABC + m CBD = 60° + 30° = 90°. Each angle is called a complement of the other. So, ABC is complement of CBD and CBD is complement of ABC

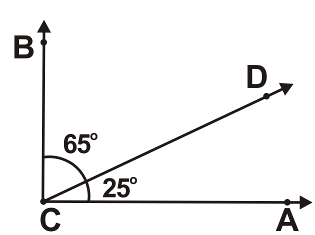


Example: Find the complement of 65°.

Solution:

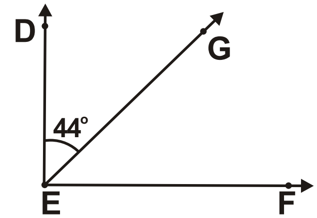
m BCD is 65°, then measure of its complementary angle ACD will be 90° – 65° = 25°. Because BCD and ACD are two complementary angles.

m BCD + m ACD = 65° + 25° = 90°



Teacher's Note Teacher should explain the concept of adjacent, complementary and supplementary angles.

Activity **Find complement of m DEF = 44° in the following figure.**



In figure, DEF and FEG are two complementary angles.

Therefore, m DEF + m FEG = ☐

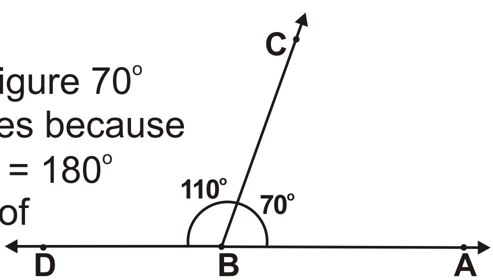
m DEF = 44° (given)

Hence, m FEG = 90° – 44° = ☐

Thus, the complement of DEF is ☐

(iii) Supplementary Angles

Two angles whose measure have a sum of 180°, are called supplementary angles. In figure 70° and 110° are supplementary angles because m ABC + m CBD = 110° + 70° = 180° Each angle is called supplement of the other.



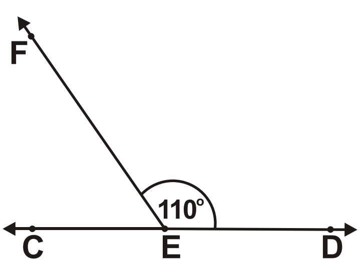
Then ABC is supplement of CBD,
or CBD is supplement of ABC.

Example: Find supplement of the given angle of 120°.

Solution:

Supplement of 120° = 180° – 120° = 60°

Activity **Find supplement of the given angle of 110°.**



In figure CEF and DEF are two supplementary angles.

Therefore m CEF + m DEF = ☐

m DEF = 110° (given)

Hence m CEF = 180° – 110° = ☐

Thus the supplement of DEF is ☐

or supplement of 110° is ☐.

EXERCISE 7.3

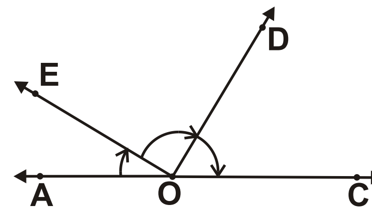
1. Look at the figure and answer the following:

(i) Is AOE adjacent to DOE?

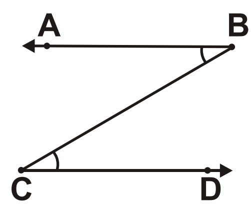
(ii) Is AOD adjacent to COD?

(iii) Is AOE adjacent to AOD?

(iv) Is DOE adjacent to EOC?



2. Is ABC adjacent to BCD?
Why or why not?



3. Find the complement of each of the following angles:

(i) 60° (ii) 76° (iii) 45° (iv) 38° (v) 15°

4. Find the supplement of each of the following angles:

(i) 25° (ii) 45° (iii) 70° (iv) 98° (v) 143°

5. Identify which of the following pair of angles are complementary and which are supplementary.

(i) 49° , 41° (ii) 154° , 26° (iii) 95° , 85°

(iv) 32° , 58° (v) 111° , 69° (vi) 14° , 76°

6. (i) Find the angle which is equal to its complement.
(ii) Find the angle which is equal to its supplement.

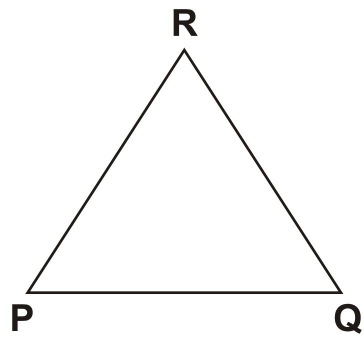
7. Can two angles be supplementary, if both of them are:

(i) Obtuse (ii) Acute (iii) Right

7.2 TRIANGLES

Definition of a triangle:

Triangle is a plane closed figure with three sides. The symbol of triangle is . Given figure is PQR. Points P, Q and R are three vertices. $\overline{PQ}$, $\overline{QR}$ and $\overline{RP}$ are three sides. PQR, QRP and RPQ are three angles.



Sum of all three angles of a triangle is equal to 180°.

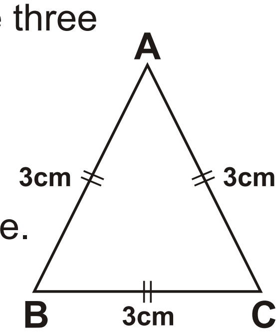
Types of Triangles with respect to their sides

According to the sides of a triangle, there are three types of a triangle.

(i) Equilateral Triangle

It is a triangle having three sides equal in length. ABC is an equilateral triangle.

m $\overline{AB}$ = m$\overline{BC}$ = m $\overline{CA}$

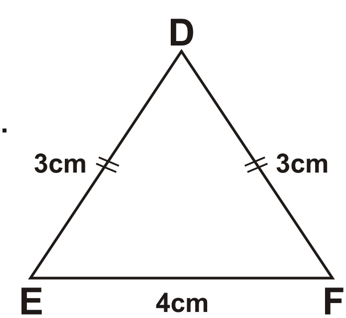


(ii) Isosceles Triangle

It is a triangle having two side equal.

DEF is an isosceles triangle.

m $\overline{DE}$ = m$\overline{DF}$

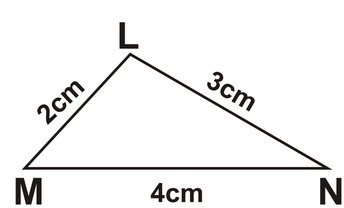


(iii) Scalene Triangle

It is a triangle of different all sides in length.

LMN is scalene triangle.

because m $\overline{LM}$ m $\overline{MN}$ m$\overline{LN}$.



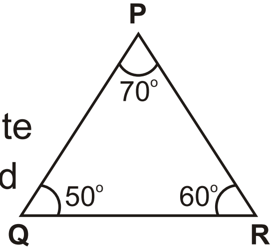
Teacher's Note Teacher should explain the types of triangles with respect to their sides and angles.

Types of Triangles with respect of their angles

According to the angles of a triangle, there are three types of a triangle.

(1) Acute-angled Triangle

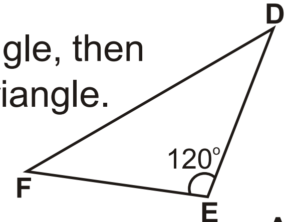
If all three angles of a triangle are acute angles, then the triangle is called an acute angled triangle. PQR is an acute angled triangle, in which P, Q and R are acute angles.



(2) Obtuse-angled Triangle

If one angle of a triangle is an obtuse angle, then the triangle is called an obtuse angled triangle.

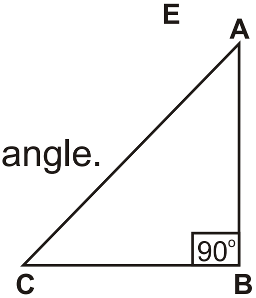
 DEF is an obtuse angled triangle, in which DEF is an obtuse angle.



(3) Right-angled Triangle

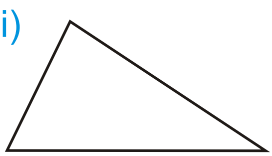
If one angle of a triangle is a right angle, then the triangle is called a right angled triangle.

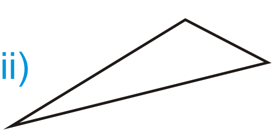
 ABC is a right-angled triangle, in which m ABC = 90°

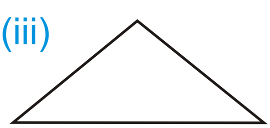


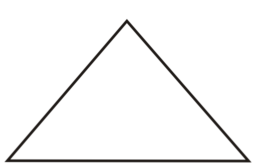
EXERCISE 7.4

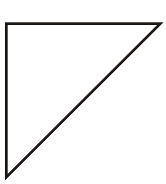
1. Measure the sides of the following triangles and then write their names.

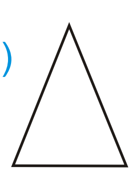
(i) 

(ii) 

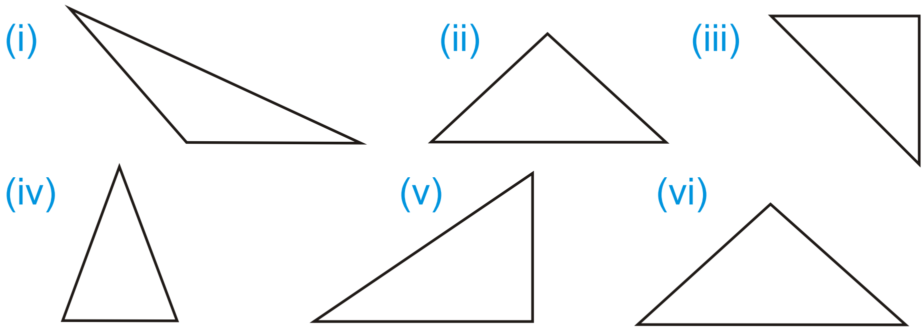
(iii) 

(iv) 

(v) 

(vi) 

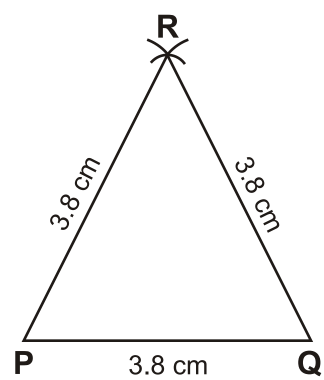
2. Use protractor, measure the angles of the following triangles and write their names.



Use compasses and straight edge to construct equilateral, isosceles and scalene triangles when three sides are given

A. Using pair of compasses and ruler to construct an equilateral triangle when the measure of each side is given.

Example 1. Construct a equilateral triangle PQR such that its each side is 3.8 cm.



Given: Each side of triangle is 3.8 cm. Since it is equilateral triangle hence measure of each angles will be 60°.

Steps of construction:

Step 1: Draw a line segment 3.8 cm length with the help of ruler. Name it as $\overline{PQ}$.

Step 2: Take P and Q as centres, open pair of compass to measure 3.8 cm. Draw an arc of radius 3.8 cm from point P end another from point Q. Such as to intersect each other. Mark the point where two arcs meet as R.

Step 3: Draw $\overline{PR}$ and $\overline{QR}$.

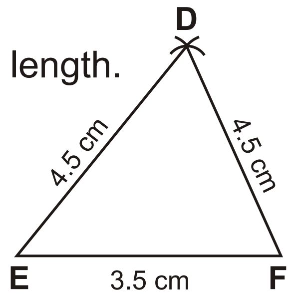
Thus PQR is the required equilateral triangle.

B. Using pair of compasses and ruler to construct an isosceles triangle when measure of sides are given.

Example 2:

Construct a triangle DEF when m $\overline{DE}$ = m $\overline{DF}$ = 4.5 cm and m $\overline{EF}$ = 3.5 cm

Steps of construction:



Step I: Use a ruler and draw $\overline{EF}$ of 3.5 cm length.

Step II: Open the pair of compasses to measure 4.5 cm. Take E and F as centre. Draw two arcs each of 4.5 cm for E and F, such as to intersect other.

Step III: Mark the point where two arcs intersect as D.

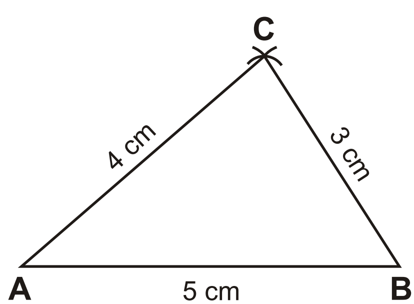
Step IV: Draw $\overline{DE}$ and $\overline{DF}$.

Thus DEF is the required isosceles triangle.

C. To construct a scalene triangle, the measures of all three sides are given. We use the following steps which are given in the example.

Example 3: Construct a triangle ABC when m $\overline{AB}$ = 5 cm, m $\overline{AC}$ = 4 cm and m $\overline{BC}$ = 3 cm

Steps of construction:



Step I: Use a ruler and draw $\overline{AB}$ of 5 cm in length.

Step II: Open pair of compasses to measure 4 cm. Take A as centre and draw an arc.

Step III: Again open pair of compasses to measure 3 cm. Take B as centre and draw another arc to meet previous arc.

Step IV: Mark the point where two arcs meet; mark as C. Draw $\overline{AC}$ and $\overline{BC}$.

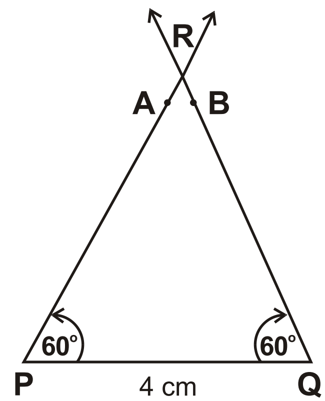
Thus ABC is the required scalene triangle.

Use a protractor and ruler to construct equilateral, isosceles and scalene triangles, when two angles and included side are given. Measure the length of the remaining two sides and one angle of the triangle.

We use the following steps given in the examples.

Example 1: Construct an equilateral triangle when

m PQR = 60° = m QPR and $m\overline{PQ}$ = 4cm



Steps of construction:

Step I: Draw a line segment PQ measuring 4 cm.

Step II: Place the central point of the protractor at point P. Read from Q and mark point A at 60°.

Step III: Place the central point of the protractor at point Q read from P and mark point B at 60°.

Step IV: From point P and Q segment draw the ray $\overrightarrow{PA}$ and $\overrightarrow{QB}$, so that the rays intersect each other at point R.

Now   PQR is the required triangle.

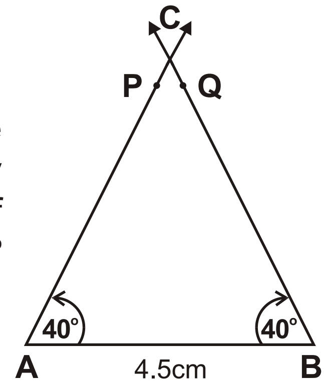
Step V: Measure the sides $\overline{PR}$ and $\overline{QR}$ and   PQR.

Thus $m\overline{PR}$ = 4cm, $m\overline{QR}$ = 4 cm and m PRQ = 60°
Hence   PQR is the required equilateral .

Example 2: Construct an isosceles   ABC, where $m\overline{AB}$ = 4.5 cm, m ABC = m CAB = 40°.

Given: Two angles of equal measured and one side is given.

Steps of construction:



Step I: Draw $\overline{AB}$ of measure 4.5 cm.

Step II: Place the central point of the protractor at point A in such a way that $\overline{AB}$ coincides the base line of the protractor. Read it upto 40° and mark at point P.

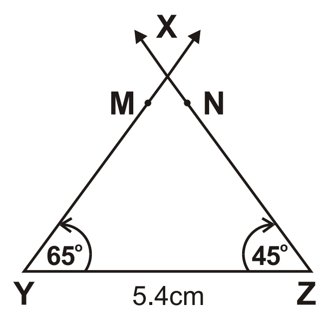
Step III: Place the central point of the protractor at point B in such a way that $\overline{AB}$ coincides the base line of the protractor. Read it upto 40° and mark it point Q.

Step IV: From points A and B, draw $\overrightarrow{AP}$ and $\overrightarrow{BQ}$ to intersect each other at a point.

Step V: Mark the point as C. In this way, we get an isosceles triangle ABC. Now measure the remaining two sides $\overline{AC}$ and $\overline{BC}$ with the help of ruler. Also measure third angle ACB with the help of protractor.

Example 3: Construct a scalene XYZ, when *m* XYZ = 65° *m* XZY = 45° and *m*$\overline{YZ}$ = 5.4cm.

Steps of construction:



Step I: With the help of ruler and pencil draw $\overline{YZ}$ of 5.4cm in the length.

Step II: Place protractor at point Y. Read it and mark point upto 65° and mark it as M.

Step III: From point Z, read the protractor up to 45° and mark at a point N.

Step IV: Through points Y and Z, draw $\overrightarrow{YM}$ and $\overrightarrow{ZN}$ to intersect each other at point X.

Step V: Measure $\overline{XY}$, $\overline{XZ}$ and YXZ

m$\overline{XY}$ = ______cm, *m*$\overline{XZ}$ = ______cm and *m* YXZ = **70°**

Thus XYZ is the required scalene triangle.

Define Hypotenuse of a right angled triangle.

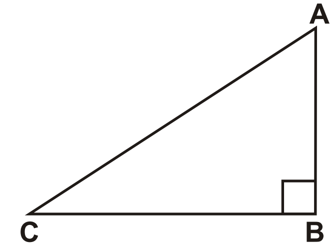
In a right triangle, the side opposite to the right angle is called hypotenuse.

Note: Hypotenuse is the longest side in a right angled triangle.

In figure, ABC is a right triangle,

where B is a right angle.

$\overline{AC}$ or $\overline{CA}$ is hypotenuse, as it is opposite to right angle B.



Use protractor and ruler to construct a right angled triangle when the measures of two angles and the measure of the side between them is given

Example:

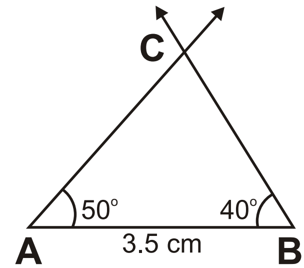
Construct a right angled ABC, where m BAC = 50°, m ABC = 40° and m $\overline{AB}$ = 3.5 cm

Steps of construction:

Step I: Draw $\overline{AB}$ of measure 3.5 cm.

Step II: Take point A as centre, draw BAC of measure 50°.

Step III: Take point B as centre, draw ABC of measure 40°.

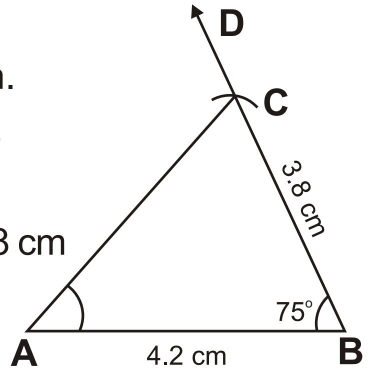


Step IV: The point where arms of both the angles meet at point C, form right angle.

Thus, ABC is the required right angled triangle.

Use protractor, a pair of compasses and ruler to construct acute angled, obtuse angled and right angled triangle when one angle and adjacent sides are given

Example 1: Construct an acute angled ABC, where *m* ABC = 75°, *m* $\overline{AB}$ = 4.2 cm and *m* $\overline{BC}$ = 3.8 cm.



Steps of construction:

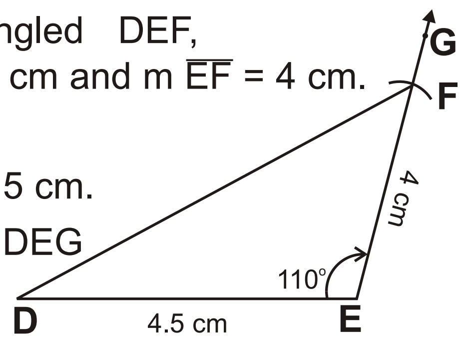
Step I: Draw $\overline{AB}$ of measuring 4.2 cm.

Step II: Using protractor make   ABD measuring 75°.

Step III: From point B, draw an arc of 3.8 cm to cut the arm $\overrightarrow{BD}$ at point C.

Step IV: Draw $\overline{AC}$. We get the required acute angled   ABC.

Example 2: Construct an obtuse angled   DEF, when m   DEF = 110°, m $\overline{DE}$ = 4.5 cm and m $\overline{EF}$ = 4 cm.



Steps of construction:

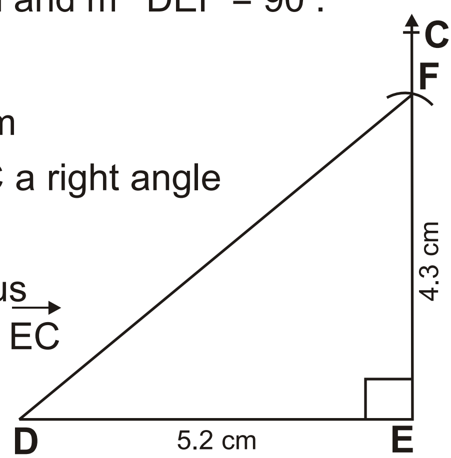
Step I: Draw $\overline{DE}$ of measuring 4.5 cm.

Step II: Using protractor make   DEG measuring 110°.

Step III: Use pair of compass, select E as centre and draw arc of 4 cm radius to cut the arc $\overrightarrow{EG}$ at point F. Use scale and draw $\overline{DF}$, which is the third side of the   DEF.

Step IV: Thus, we get the required obtuse angled   DEF.

Example 3: Construct a right angled triangle with sides m$\overline{DE}$ = 5.2 cm, m$\overline{EF}$ = 4.3 cm and m   DEF = 90°.



Steps of construction:

Step I: Draw $\overline{DE}$ measuring 5.2cm

Step II: From point E, draw   DEC a right angle with the help of protractor.

Step III: With E as centre and radius 4.3 cm, draw an arc to cut $\overrightarrow{EC}$ at point F, the third vertex of   DEF.

Step IV: Draw $\overline{DF}$ by joining the points D and F.

Thus DEF is the required right angled triangle.

EXERCISE 7.5

1. Using a ruler and a pair of compasses, construct the following equilateral triangles.

(i) ABC where $m\overline{AB} = m\overline{BC} = m\overline{CA} = 4$ cm.

(ii) DEF where $m\overline{DE} = m\overline{EF} = m\overline{DF} = 3.5$ cm.

(iii) PQR where $m\overline{PQ} = m\overline{QR} = m\overline{PR} = 5.2$ cm.

2. Using a ruler and a pair of compasses, construct the following isosceles triangles.

(i) ABC where $m\overline{AB} = m\overline{BC} = 6$ cm; $m\overline{AC} = 4$ cm.

(ii) DEF where $m\overline{DE} = 2.5$ cm, $m\overline{EF} = m\overline{DF} = 4$ cm.

(iii) PQR where $m\overline{PQ} = 4$ cm, $m\overline{QR} = m\overline{PR} = 3.5$ cm.

3. Using a ruler and a pair of compasses, construct the following scalene triangles.

(i) ABC where $m\overline{AB} = 4.8$ cm, $m\overline{BC} = 3$ cm and $m\overline{AC} = 5$ cm.

(ii) PQR where $m\overline{PQ} = 4.5$ cm, $m\overline{QR} = 5$ cm and $m\overline{PR} = 3.5$ cm.

(iii) EFG where $m\overline{EF} = 5.2$ cm, $m\overline{FG} = 4.4$ cm and $m\overline{GE} = 3$ cm.

4. Using ruler, protractor and a pencil to construct the following equilateral, isosceles and scalene triangles. Also measure the remaining two sides and one angle in each triangle.

(i) An equilateral ABC where $m\overline{AB} = 5.7$ cm,
m ABC = *m* BAC = 60°.

(ii) An isosceles LMN where $m\overline{LM}$ = 5 cm,
m LMN = *m* MLN = 70°.

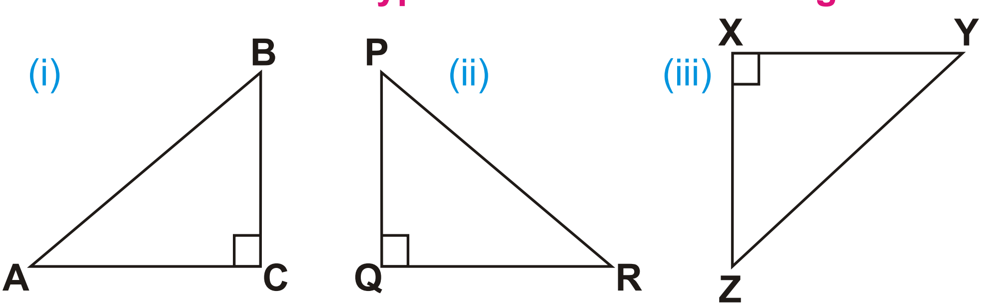
(iii) A scalene XYZ where $m\overline{XY}$ = 6 cm,
m XYZ = 60°; *m* YXZ = 50°.

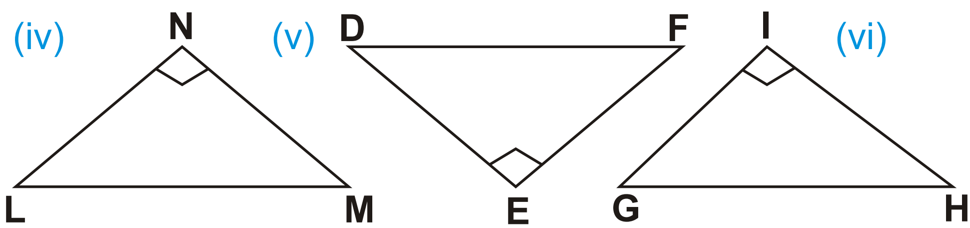
(iv) An equilateral RST where $m\overline{RS}$ = 4.8 cm
and *m* RST = *m* TRS = 60°.

(v) A scalene EFG where $m\overline{EF}$ = 5.5 cm,
m EFG = 75° and *m* GEF = 65°.

(vi) An isosceles JKL where *m* JLK = 45°. *m* $\overline{JL}$ = 4.6 cm
and *m* KJL = 45°.

5. Look at the following right angled triangles. Name and measure the hypotenuse in each triangle.





6. Using a ruler and protractor to construct the following triangles. Measure the length of remaining two sides and one angle of the triangle.

(i) ABC where
m $\overline{AB}$ = 5 cm,
m BAC = 55°,
m ABC = 35°

(ii) JKL where
m KJL = 65°,
m JKL = 25°,
m $\overline{JK}$ = 4.8 cm

(iii) PQR where
m QPR = 30°
m PQR = 60°,
$m\,\overline{QP}$ = 4 cm

(iv) STU where
$m\,\overline{ST}$ = 5.3 cm,
m STU = 75°
m TSU = 15°

7. Use protractor, a pair of compasses and ruler to construct the following triangles:

(i) Acute angled ABC, when m BAC = 65°,
$m\,\overline{AB}$ = 3.6 cm and $m\,\overline{AC}$ = 4.4 cm.

(ii) Right angled DEF, when m DEF = 90°,
$m\,\overline{DF}$ = 3 cm and $m\,\overline{EF}$ = 4 cm.

(iii) Obtuse angled LMN, m NML = 110°,
$m\,\overline{MN}$ = $m\,\overline{ML}$ = 5 cm.

(iv) Acute angled PQR, m PQR = 60°,
$m\,\overline{PQ}$ = $m\overline{QR}$ = 4 cm.

(v) Right angled XYZ, when m XYZ = 90°,
$m\,\overline{XY}$ = 4.2 cm = $m\overline{YZ}$

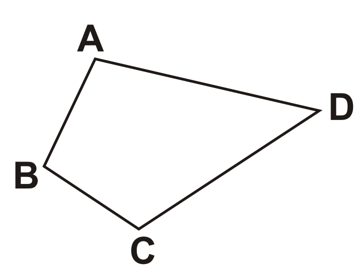
(vi) Obtuse angled STU, when m STU = 120°,
$m\,\overline{ST}$ = 3.6 cm and $m\,\overline{TU}$ = 4.2 cm.

7.3 QUADRILATERALS

A closed figure with four sides is called a quadrilateral

In the figure, quadrilateral ABCD has four sides $\overline{AB}$, $\overline{BC}$, $\overline{CD}$ and $\overline{AD}$.

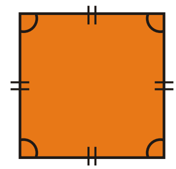
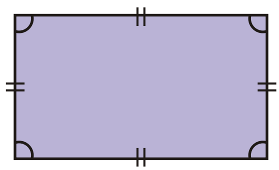
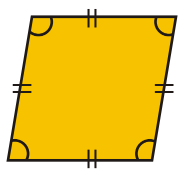
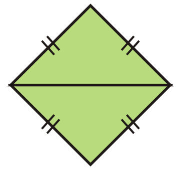
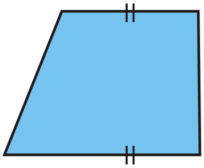
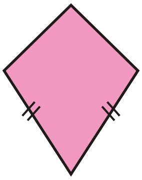
It has four angles A, B, C and D.



The sum of measure all four angles of quadrilateral is equal to 360°.

Recognize the kinds of quadrilateral.

The kinds of a quadrilateral are:

Quadrilateral	Figure	Properties
Square		▪ All the four sides are equal ▪ Opposite sides parallel ▪ Each angle is of 90°
Rectangle		▪ Opposite sides equal ▪ Opposite sides are parallel ▪ Each angle is of 90°
Parallelogram		▪ Opposite sides equal ▪ Opposite sides are parallel ▪ Opposite angles are equal. ▪ None of angle measure 90°
Rhombus		▪ Four equal sides ▪ Opposite sides are parallel ▪ Opposite angles are equal. ▪ None of angle measure 90°
Trapezium		▪ Only one pair of opposite parallel sides
Kite		▪ Two pairs of adjacent equal sides ▪ Here one pair of equal angles

Teacher's Note Teacher should help students to recognize the kinds of quadrilateral.

Use protractor, set squares and ruler to construct square and rectangle with given sides.

Example 1: With the help of ruler and protractor construct a rectangle of sides 4.5 cm and 2.5 cm.

Steps of construction:

Step I: Use ruler, draw $\overline{EF}$ of 4.5 cm.

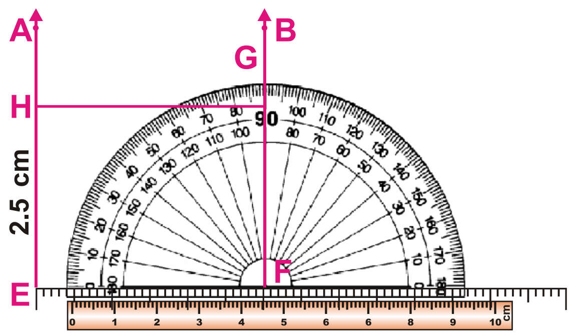
Step II: At point F, draw EFB = 90° with the help of protractor.

Step III: Using ruler cut $\overrightarrow{FB}$ such that $\overline{FG}$ of 2.5 cm

Step IV: At point E, draw FEA = 90° with the help of protractor.

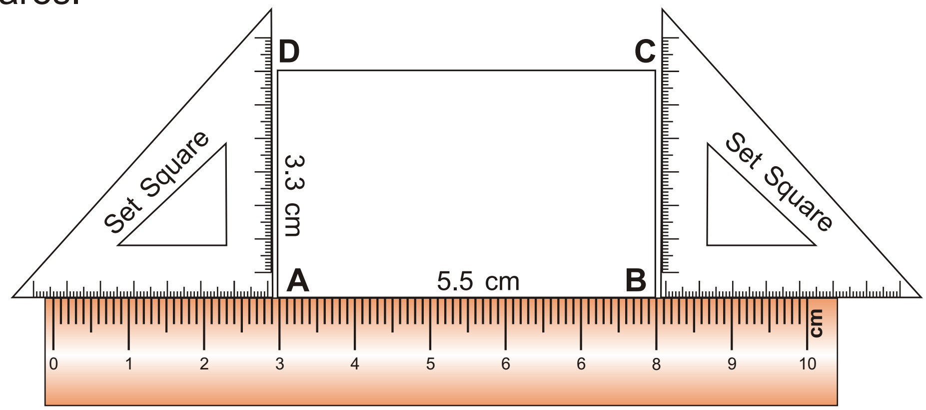
Step V Using ruler, cut $\overrightarrow{EA}$ such that $\overline{EH}$ of 2.5 cm.

Step VI: Draw $\overline{GH}$ by joining the points G and H i.e. draw $\overline{GH}$ of 4.5 cm.



Hence quadrilateral EFGH is the required rectangle.

Example 2: To construct a rectangle of which the length is 5.5 cm and breadth is 3.3 cm with the help of ruler and a set squares.



Teacher's Note Teacher should help the students how to use protractor, set square and ruler for construction of rectangle.

Steps of construction:

Step I: Use ruler, draw $\overline{AB}$ of 5.5 cm length.

Step II: Place both set squares on $\overline{AB}$, such that their right angled perpendicular sides are parallel to each other.

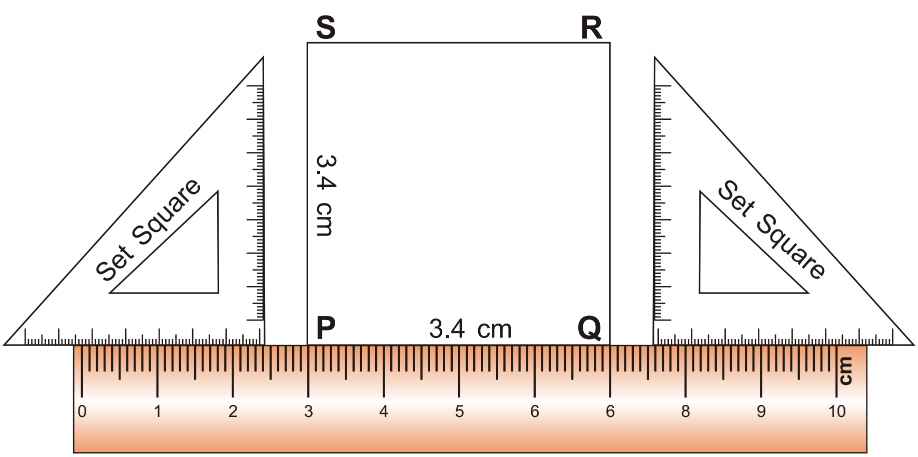
Step III: With the help of set squares, construct a perpendicular at point A. Cut it 3.3 cm and mark it point D.

Step IV: Construct perpendicular with the help of set squares at point B. Draw another perpendicular $\overline{BC}$ and cut it 3.3 cm length and mark it point C.

Step V Join point C and D with the help of ruler and draw $\overline{CD}$.

Thus quadrilateral ABCD is the required rectangle.

Example 3: Construct a square of which the length of a side is 3.4 cm with the help of ruler and a set square.



Steps of construction:

Step I: Use ruler, draw $\overline{PQ}$ = 3.4 cm long.

Step II: Place both set squares on $\overline{PQ}$, such that their right angled perpendicular sides are parallel to each other.

Step III: With the help of set square, draw a perpendicular on point P. Measure it 3.4 cm and mark it as point S.

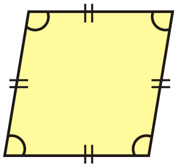
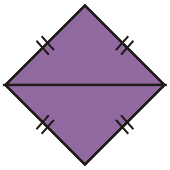
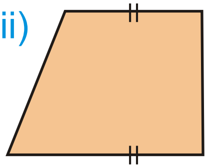
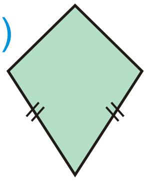
Step IV: Construct another perpendicular at point Q. Cut it 3.4 cm and mark it point R.

Step V: Use ruler, Join point R and S then draw $\overline{RS}$ = 3.4 cm long.

Thus quadrilateral PQRS is the required square.

EXERCISE 7.7

1. Recognize the names and give the answers of the following for each quadrilateral.

(i)  (ii)  (iii)  (iv) 

__________ __________ __________ __________

How many?

(i) Sides ________ names ________________________

(ii) Angles ________ names ________________________

(iii) Vertex _________

(iv) Measurement of each angle__________________

2. Construct rectangle with sides given below with the help of a ruler and a protractor.

(i) 4 cm, 3c m (ii) 6 cm, 3.5 cm (iii) 5.5 cm, 2.8 cm

3. Construct a square with a side given below with the help of a ruler and a protractor.

(i) 3 cm (ii) 4 cm (iii) 5.4 cm

4. Construct rectangles with sides given below with the help of a ruler and set squares.

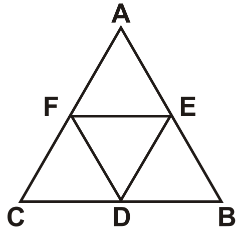
(i) 5 cm, 4 cm (ii) 6 cm, 3 cm (iii) 4.6 cm, 3.5 cm

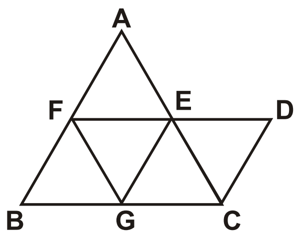
5. **Construct a square with a side given below with the help of a ruler and a set squares.**

(i) 4 cm (ii) 5 cm (iii) 4.4 cm

REVIEW EXERCISE 7

1. Marium and Sakina start from a point A. Marium moves towards east up to E and Sakina moves towards south up to S. Draw their paths and name the kind of angle which will be formed between them.
2. State the kinds of angle that is formed between the following directions:
   (i) East and West (ii) East and North
   (iii) From North to West through East
3. Take three non-collinear points A, B and C
   Draw $\overline{AB}$, $\overline{BC}$ and $\overline{CA}$. What figure do you get? Name it.
4. Is it possible to have a triangle, in which:
   (i) Two of the angles are right angels?
   (ii) Two of the angles are acute?
   (iii) Two of the angles are obtuse?
   (iv) Each angle is less than 60°.
5. How many quadrilaterals are formed in the adjoining figure? Name them.





6. Write the names of the triangles and quadrilaterals formed in the figure. Also mention their kinds.
7. Two angles of a triangle are of measure 65° and 45°. Find the measure of the third angle.
8. Prove that a square is a rectangle but a rectangle is not a square.

PERIMETER AND AREA

PERIMETER AND AREA

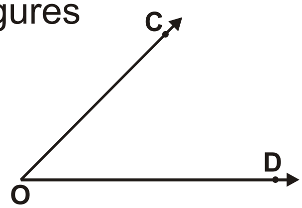
Recognize region of a closed figure.

There are two types of figures in geometry.

(a) Open figures (b) Closed figures

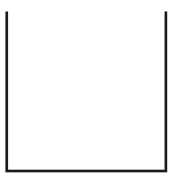
(a) Open figures:

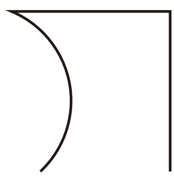
A line 

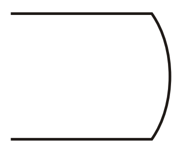
and an angle 

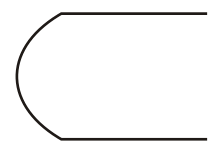
are examples of open figures.

Here are some more examples of open figures.


Fig. 1


Fig. 2


Fig. 3


Fig. 4

We can not determine the region enclosed by the open figures because it is open on at least one side.

(b) Closed figures

Consider an other figure (i). It is closed figure represented by the triangle XYZ. It shows the triangular region which is marked by dots. $\overline{XY}$, $\overline{YZ}$, and $\overline{ZX}$ form the boundary of the triangular region XYZ. The sides $\overline{XY}$, $\overline{YZ}$, and $\overline{ZX}$ are the parts of triangular region.

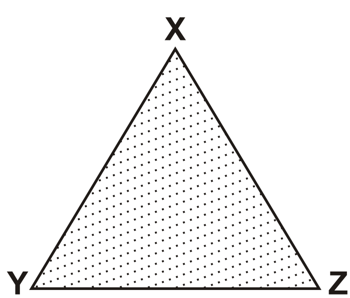
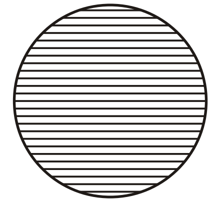


Fig. (i)

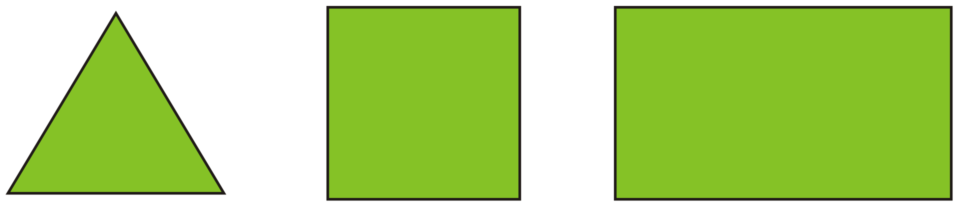
We can also show the closed figure in the form of the circular region figure (ii). The boundary of this circular region is the circle itself.


Fig. (ii)

Teacher's Note Teacher should demonstrate the open and closed geometrical figures through thread/rope.

Differentiate between perimeter and area of a region.

Look at the following figures.



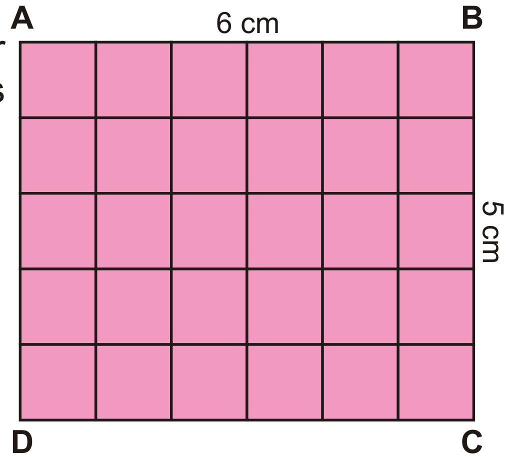
A triangular region A square region A rectangular region

Here we see that these regions are bounded of line segments only. This enables us to find the distance around the figure or the length of the boundary which is known as the **perimeter** of the figure.

"Perimeter" is the measure of the total length of the sides, or line segments of any figure. It is measure of length of the sides, or the boundary of the region. The unit of the perimeter is same as that of length.

"Area" is the measure of the region of a closed figure. We can find the area of a closed figure by fitting units squares.

Example: Find the perimeter and area of rectangle with sides of 5cm and 6cm.



Solution:

Length = 6 cm

Breadth = 5 cm

Perimeter = B + L + B + L

= 5 + 6 + 5 + 6

= 22 cm

In given rectangle there are total 30 unit squares. So, the area of ABCD = 30 squares cm.

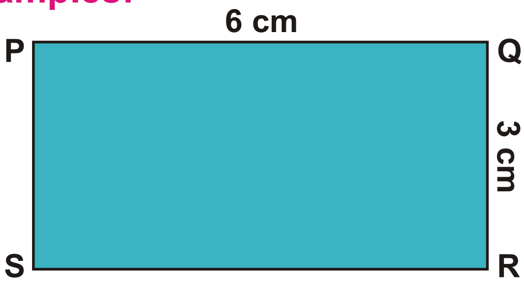
Identify units for measurement of perimeter and area.

(a) Units for the perimeter

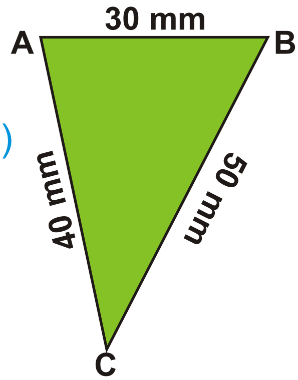
Look at the following figures:

Examples:

(i)



(ii)



Here PQRS is a rectangle.

$m\overline{PQ}$	=	6 cm
$m\overline{QR}$	=	3 cm
$m\overline{SR}$	=	6 cm
$m\overline{PS}$	=	+ 3 cm
Perimeter		**18 cm**

Here ABC is a triangle.
Remember 10 mm = 1 cm

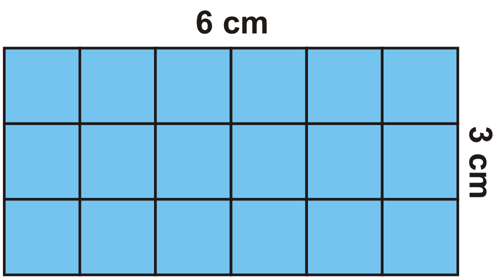
$m\overline{AB}$	=	**30 mm**	=	3 cm
$m\overline{BC}$	=	**50 mm**	=	5 cm
$m\overline{AC}$	=	**40 mm**	=	+ 4 cm
Perimeter				**12 cm**

= (30 + 50 + 40) mm
= 120 mm = 12 cm

> The unit for the perimeter is the same as the length used, i.e we can use mm, cm, m and km as the units for measurement of the perimeter.

(b) Units of the area

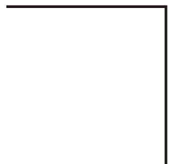
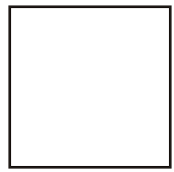
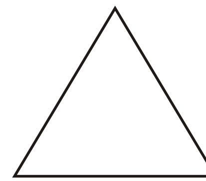
In the figure the length of rectangle is 6 cm and its breadth is 3 cm. We can find its area by fitting each unit squares with one side of 1 cm, there are total 18 unit squares in the rectangle.

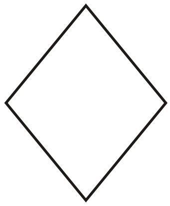
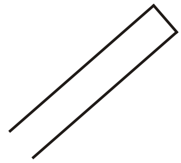


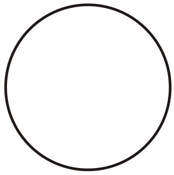
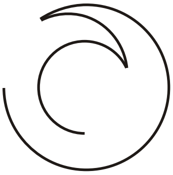
So its area is 18 squares with side of 1 cm each.
i.e Area = 18 sq. cm
Here the unit of area is sq. cm
Similarly sq. m, sq. km, sq. mm are also the units of area.

EXERCISE 8.1

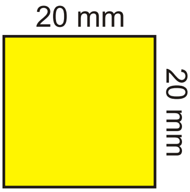
A. **Look at the following figures carefully. (✓) the shapes which are closed figures and (✗) the open figures.**

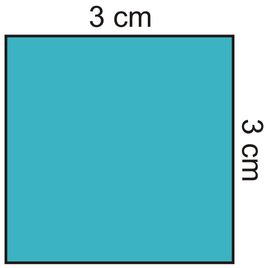
(1) 
(2) 
(3) 

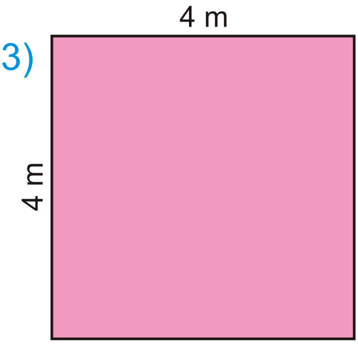
(4) 
(5) 
(6) 

(7) 
(8) 
(9) 

B. **Find the perimeter and write the unit of perimeter for each of the following:**

(1) 

(2) 

(3) 

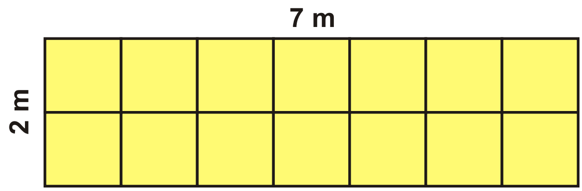
(1)
(a) Here perimeter ______.
(b) Unit of perimeter ______.

(2)
(a) Here perimeter ______.
(b) Unit of perimeter ______.

(3)
(a) Here perimeter ______.
(b) Unit of perimeter ______.

C. Find the area by counting small unit squares and write the unit of area for each of the following:

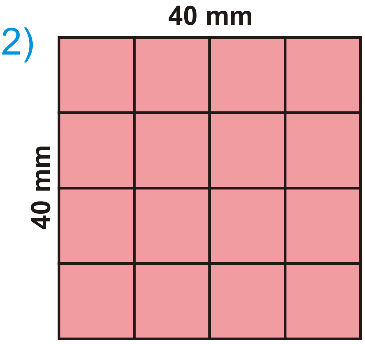
(1)



(a) Area ________ squares.

(b) Unit of area ________.

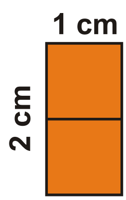
(2)



(a) Area ________ squares.

(b) Unit of area ________.

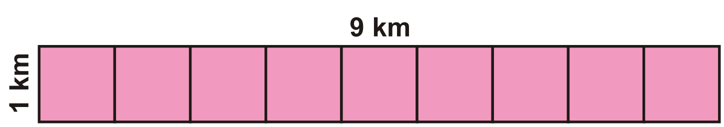
(3)



(a) Area ________ squares.

(b) Unit of area ________.

(4)



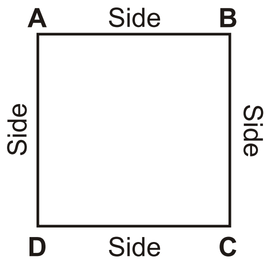
(a) Area ________ squares.

(b) Area Unit of area ________.

Write and apply the formulas for the perimeter and area of a square and rectangle

(a) Formulas for perimeter of a square and rectangle

(i) We know that a square is a quadrilateral shape in which all its four sides are equal.

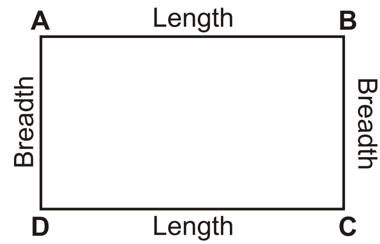


Perimeter of the square

$$ABCD = m\overline{AB} + m\overline{BC} + m\overline{CD} + m\overline{DA}$$
$$= \text{side} + \text{side} + \text{side} + \text{side}$$
$$= 4 \times \text{side}$$
$$= 4 \times (\text{length of a side of square})$$

Thus, formula for perimeter of a square figure = 4 x length of side

(ii) Draw a rectangle ABCD. Measure its sides.



Then find its perimeter as follows:

Perimeter of the rectangle ABCD

$= m\overline{AB} + m\overline{BC} + m\overline{CD} + m\overline{DA}$

= length + breadth + length + breadth

= 2 x length + 2 x breadth

= 2 x (length + breadth)

Thus, formula for perimeter of a rectangle

= 2 x (length + breadth)

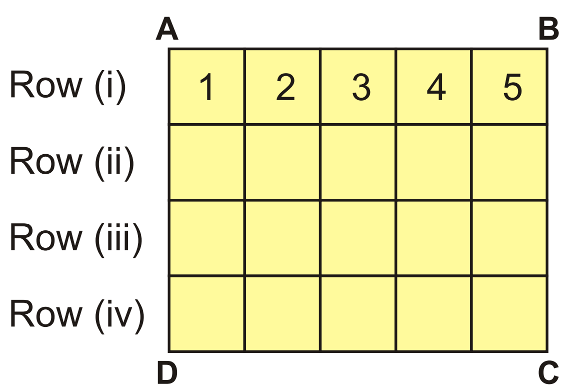
(b) Formulas for area of a square and rectangle

Activity 1

Look at the rectangle ABCD with the length of 5 cm and breadth 4 cm.

Length ________

Breadth ________



(i) What is the length of rectangle ABCD?

(ii) What is the breadth of rectangle ABCD?

(iii) How many rows in the figure?

(iv) How many unit squares in one row?

(v) How many unit squares altogether?

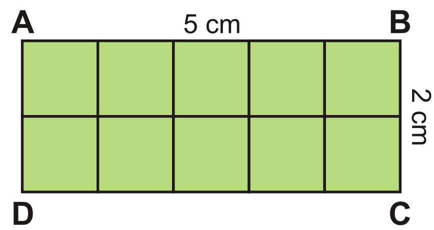
Thus, the area of given rectangle ABCD = 20 cm^2.

So, area of rectangle = Length x Breadth

Thus the formula for finding the area A of a rectangle is:

Area of a rectangle = Length x Breadth
or A = L X B

Example. Find area of a rectangle whose length is 5 cm and breadth is 2 cm.



Solution:

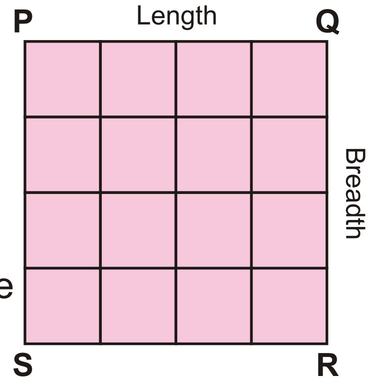
Here length = 5 cm
breadth = 2 cm

Area of a rectangle ABCD

= Length x Breadth.
= 5 x 2 = 10 sq. cm



Activity 2



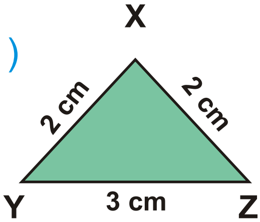
Using formula, find area of the given square shape.

Thus, the area of a square PQRS = Side x Side

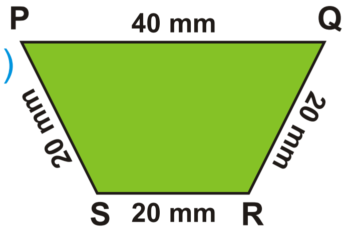
EXERCISE 8.2

A. Find the perimeter of each of the following figures:

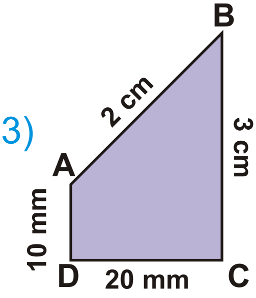
(1)



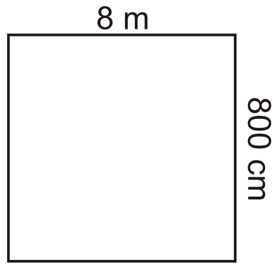
(2)

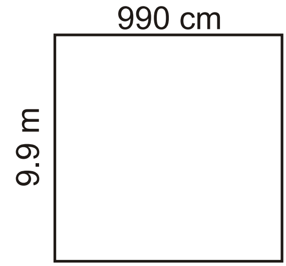


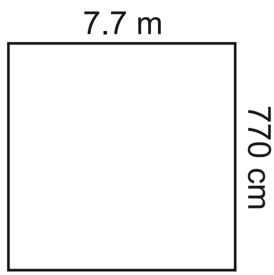
(3)

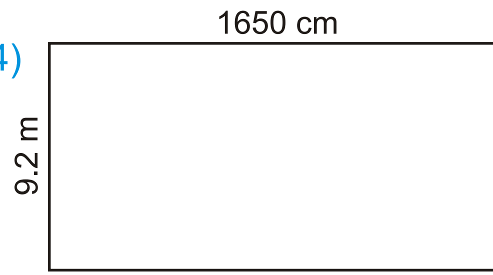


B. Find the area of the following shapes by using formula.

(1)


(2)


(3)


(4)


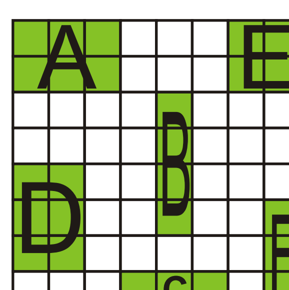
C. Find the area and perimeter of each of the following rectangles.

(1) L = 3 cm, B = 2 cm
(2) L = 5 cm, B = 1 cm
(3) L = 4 cm, B = 3 cm
(4) L = 8 cm, B = 2 cm
(5) L = 9 cm, B = 5 cm
(6) L = 7 cm, B = 4 cm
(7) L = 4.5 cm, B = 2 cm
(8) L = 8 cm, B = 3.5 cm

D. Find area and perimeter of a square whose sides are given below:

(1) 4 cm
(2) 6 cm
(3) 7.5 cm
(4) 8.2 cm
(5) 5 cm 6 mm
(6) 9 cm 2 mm

E. Answer the questions.

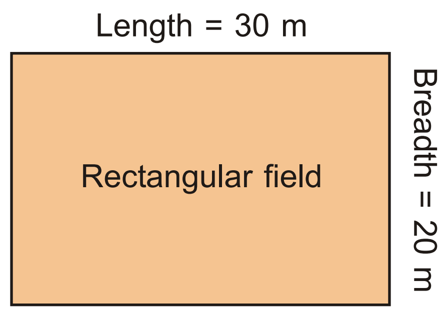


(1) Which shape has the same area as shape B?
(2) Which shape has the same area as shape C?
(3) Which rectangle shapes are equal in area as rectangle A?
(4) Which rectangle shapes are equal in area as square E?
(5) Which shapes have the same area?

Solve appropriate problems of perimeter and area.

Example 1. Length of a rectangular field is 30 m and its breadth is 20 m. Find the perimeter of the rectangular field.

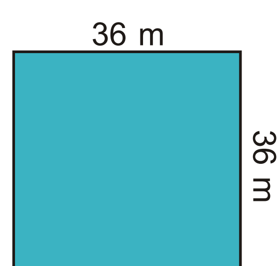
Solution:



Length of the given rectangular field = 30 m
Breadth of the given rectangular field = 20 m
Formula: Perimeter of the given rectangular field is
2 x (Length + Breadth)
= 2 x (30 m + 20 m)
= 2 x 50 m = 100 m

Example 2. A square ground has each side 36 m. What distance will a boy cover by cycling around the ground three times?

Solution: The side of the square ground is 36 m each.
Therefore perimeter of the ground is:
4 x side = 4 x 36 m
= 144 m



In one time boy will cover 144 m distance.
In three times the boy will cover 144 x 3 = 432 m

	1 4 4
x	3
	4 3 2

Example 3. The perimeter of a rectangular park is 320m. Its length is 70m. Find the breadth.

Solution:

Perimeter = 320m

Length = 70m

Perimeter = 2 x (length + breadth)

$$\text{Breadth} = \frac{\text{Perimeter}}{2} - \text{Length}$$

$$= \left(\frac{\overset{160}{\cancel{320}}}{\underset{1}{\cancel{2}}}\right) - 70 = \frac{160}{1} - 70$$

$$= 160 - 70 = 90\text{m}$$

Example 4. The perimeter of a square shape is 280 cm. Find the length of each side.

Solution:

Perimeter = 280 m

$$\text{Length of each side} = \frac{\text{Perimeter}}{4}$$

$$= \frac{\overset{70}{\cancel{280}}}{\underset{1}{\cancel{4}}} = \frac{70}{1} = 70\text{ cm}$$

Example 5. A rectangular field is 80m long and 60m wide. Find the cost of laying green grass in it; at a rate of Rs 2.50 per sq. metre.

Solution:

Rectangular field has length = 80m, width = 60m

Area of rectangular field = Length x Width

= 80m x 60m

= 4800 sq. m

Now let us find the cost of laying green grass in the field.

One sq. metre costs Rs 2.50

4800 sq. metres will cost Rs (4800 x 2.50)

= Rs 12000

EXERCISE 8.3

1. A rectangular park is 84 m long and 56 m broad. Find the perimeter of the park.

2. A square room is 7 m wide. Find the area of the room.

3. A square picture is 60 cm wide. How long wooden frame will be required to reap it form all sides?

4. The length and breadth of a rectangular agriculture field are 190 m and 160 m respectively. Find the area and the perimeter of the field.

5. How much lace is required to fix around a rectangular bed sheet, whose length is 2 m 80 cm and width is 1 m 50 cm?

6. Find the area of both fields; a square of 25 m side and a rectangle 30 m in length and 20 m in breadth.

7. A rectangular agriculture park is 75 m long and 40 m wide. Find the cost of laying green grass in it at the rate of Rs 25 per square metre.

8. Consider a room 15m long and 12m wide. A square carpet 10m x 10m is placed on it.
   (i) What is the area of the floor of the room?
   (ii) What is the area of the carpet?
   (iii) Which is the more in area; the floor or the carpet? And by how much?

REVIEW EXERCISE 8

A. Choose and tick (✓) the correct answer.

1. The space occupied by the boundary of a shape is called:
(a) Triangle (b) Square (c) Perimeter (d) Region

2. The distance along all the sides of a closed shape is called:
(a) Triangle (b) Square (c) Perimeter (d) Region

3. The perimetre of a square of length of each side 4 cm is:
(a) 16 m (b) 16 m^2 (c) 16 cm (d) 16 cm^2

4. The area of a square having each side of 3 cm is:
(a) 6 cm (b) 9 cm (c) 9 cm^2 (d) 12 cm

5. The area of a rectangle with length 4 cm and breadth 2 cm is:
(a) 4 cm (b) 8 cm (c) 8 cm^2 (d) 12 cm

6. The perimeter of a rectangle with length 6 cm and breadth 3 cm is:
(a) 6 cm (b) 18 cm (c) 9 cm (d) 15 cm

B. Answer the following questions.

1. Write formula of area of a square.
2. Write formula of perimeter of a rectangle.
3. Find the perimeter and area of a square of side 7 cm.
4. Find the perimeter and area of a rectangle with length and breadth 8 cm and 5 cm respectively.

Unit 9

INFORMATION HANDLING

9.1 AVERAGE

Define an average (arithmetic mean)

Consider the following example.

Example. Once Shahid Afridi made 6 runs in the first over, 10 runs in the second over, 8 runs in the third over and 4 runs in the fourth over.

Now answer the following questions:

1. What was the number of his total runs?

$6 + 10 + 8 + 4 =$ **28 runs**

2. How many overs did he play?

4 overs

3. What was his run rate (runs per over)?
To answer this question we find average as under:

$$\text{Run rate} = \frac{\text{Total runs made in all the overs}}{\text{Total numbers of overs played}}$$

$$= \frac{\overset{7}{\cancel{28}}\ \text{runs}}{\underset{1}{\cancel{4}}\ \text{overs}} = 7 \text{ runs per over}$$

The run rate **7** is the average score. This 7 represents his performance in all the overs.

Or

Average is the, overall representative value of the information.

Average = Sum of the quantities divided by the total number of quantities

Teacher's Note Teacher should help the students to understand the concept of average and develop the formula to find the average.

Find an average of given numbers.

Example. Find the average of 5, 8, 10, 12 and 20.

Solution:

Sum of given numbers = 5 + 8 + 10 + 12 + 20

$$\text{Average} = \frac{\text{Sum of quantities}}{\text{Total number of quantities}}$$

$$\text{Average} = \frac{5 + 8 + 10 + 12 + 20}{5} = \frac{55}{5}$$

$$= \frac{\cancel{55}^{\,11}}{\cancel{5}_{\,1}} = \frac{11}{1} = 11$$

Thus the average of the given numbers is **11**.



Activity 1 **Find the average of first five even numbers.**

Solution: First five even numbers are: 2, 4, 6, 8 and 10.

$$\text{Average} = \frac{\text{Sum of numbers}}{\text{Total number}}$$

Solve it,

$$= \frac{2 + 4 + 6 + 8 + 10}{5} = \frac{\square}{\square} = \square$$



Activity 2 **Find the average of first five odd numbers.**

Solution: First five odd numbers are: 1, 3, 5, 7 and 9.

$$\text{Average} = \frac{\text{Sum of numbers}}{\text{Total number}}$$

Solve it,

$$= \frac{\qquad\qquad}{\qquad} = \frac{\square}{\square} = \square$$

Example: Find the average of given numbers.

4.5, 5.5, 7.5, 6.5, 6.5, 9.5, 7.6

Solution: $\text{Average} = \dfrac{\text{Sum of given quantities}}{\text{Numbers of given quantities}}$

$= \dfrac{4.5 + 5.5 + 7.5 + 6.5 + 6.5 + 9.5 + 7.6}{7}$

$= \dfrac{47.6}{7} = \mathbf{6.8}$

EXERCISE 9.1

Find the average (mean) of the following numbers.

(1) 12, 14, 16, 18 and 20

(2) 1, 2, 3, 4, 5, 6 and 7

(3) 6, 7, 8, 9, 7, 6, 5 and 15

(4) 2, 3, 5, 7, 11, 13, 17 and 19

(5) $\frac{1}{2}, \frac{2}{5}, \frac{3}{4}$ and $\frac{4}{5}$

(6) $\frac{3}{10}, \frac{7}{20}, \frac{11}{30}, \frac{13}{40}$ and $\frac{17}{50}$

(7) 1.1, 2.2, 3.3, 4.4, 5.5 and 6.6

(8) 13.5, 7.5, 6.5, 9.5, 5.5 and 7.5

(9) $1\frac{2}{3}, 4\frac{5}{6}, 7\frac{8}{9}, 10\frac{11}{12}$ and $13\frac{14}{15}$

(10) $6\frac{5}{6}, 7\frac{1}{2}, 8\frac{1}{3}$ and 5

Solve real life problems involving average.

Example 1. The attendance of class V during six days of a week was: 44, 40, 37, 42, 35 and 36. Find the average attendance?

Solution: Daily attendance = 44, 40, 37, 42, 35, 36.

$\text{Average} = \dfrac{\text{Total attendance}}{\text{Number of days}}$

$\text{Average attendance} = \dfrac{44 + 40 + 37 + 42 + 35 + 36}{6} = \dfrac{234}{6}$

$= \dfrac{\cancel{234}^{39}}{\cancel{6}_{1}} = \dfrac{39}{1} = 39$

Thus average attendance is **39**.

Example 2. The business train covers a distance of 450 km in 6 hours. What is its average speed?

Solution:

$$\text{Average speed} = \frac{\text{Distance covered}}{\text{Number of hours}} = \frac{450 \text{ km}}{6 \text{ hours}}$$

$$= \frac{\overset{75}{\cancel{450}} \text{ km}}{\underset{1}{\cancel{6}} \text{ hours}} = \frac{75 \text{ km}}{1 \text{ hr}} = 75 \text{ km per hr}$$

Thus average speed of the train will be **75 km/hr**.

EXERCISE 9.2

1. Rabia obtained 65 marks in Maths, 72 marks in Urdu, 60 marks in Science, 75 marks in Sindhi and 70 marks in Islamiyat. Find her average marks.
2. Kalsoom saved rupees 13, 15, 12, 20, 25, 30 and 18 during a week. What is her average saving per day?
3. The maximum temperature of Sanghar city recorded during the week of June last year was 36.3°C, 42.7°C, 41.6°C, 38.5°C, 40.4°C, 41.9°C and 42.8°C. Find the average temperature during that week.
4. A Qari wants to recite the Holy Qura'n in 15 days during the holy month of Ramzan. What will be the average number of Paras he has to recite daily?
5. Saleem scored 50, 70, 100, 60 runs in the four one day matches. What was his average score?
6. A labour earns Rs 577 on the first day, Rs 600 on the second day and Rs 725 on the third day. Find his average income per day.

7. A train covers a distance of 560 km in 8 hours from Karachi to Rohri. What is its average speed?

8. A car covers a distance of 55 km in the first hour, 60 km in the second hour, 45 km in the third hour and 30 km in the fourth hour. Find the average speed of the car per hour.

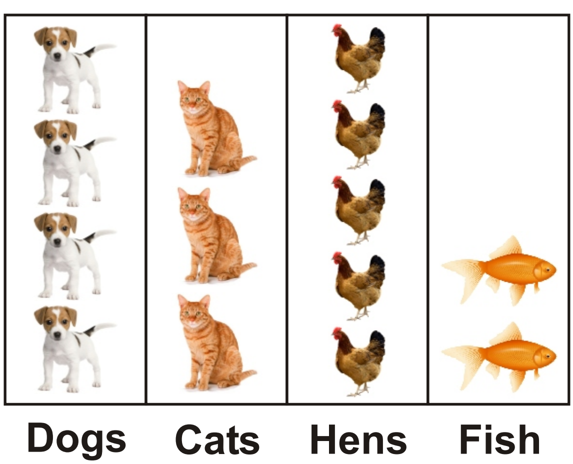
9. Akmal get 8 wickets for 72 runs. Find average runs he has given for wicket.

10. The total rainfall recorded in 6 different cities was 48 mm of Sindh Province during last year. Find the average rainfall for each city.

9.2 BLOCK, COLUMN AND BAR GRAPH

Draw block graphs or column graphs

We have learnt picture graph in previous classes.
Let us revise an example.
The number of animals in Ali's form house has been represented in picture graph.

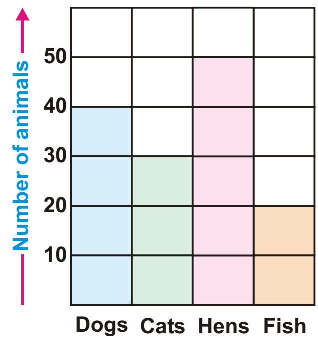


Each  represent 10 dogs. Each  represent 10 cats.

Each  represent 10 hens. Each  represent 10 fish.

Unit 9 INFORMATION HANDLING
(Block, Column and Bar Graph)

This diagram is called **picture graph**. Picture graph helps us to see quantity of each thing/item at a glance and help us to compare their differences. We can show these number of animals in blocks as:

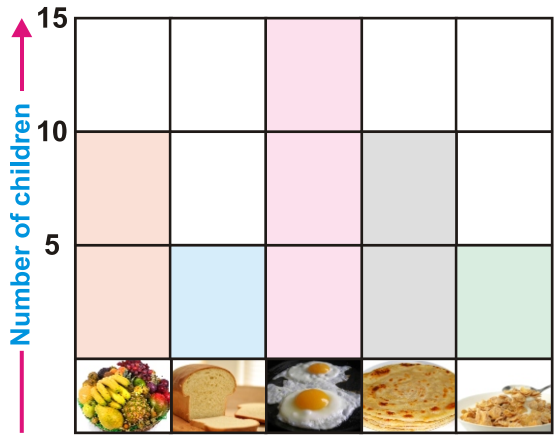


We call this a **block graph** or **column graph**. Column graph is used to represent small objects and quantities.

Example 1. Following table shows the result of the favourite breakfast food taken by class V students. Draw a block graph.

Fresh Fruit	Toast/ Bread	Eggs	Paratha	Cereal
10	5	15	10	5

Solution:



Read the above graph and answer the following questions:

(i) Which breakfast food is most favourite?

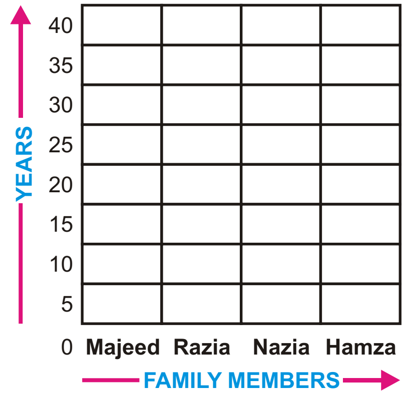
(ii) Which breakfast food is equally favourite?

(iii) Which breakfast food is least favourite?

Activity **The ages of a family members are as under. Help Sameer to draw the block graph.**

Majeed is 30 years old.
Razia is 25 years old.

Nazia is 10 years old.
Hamza is 5 years old.



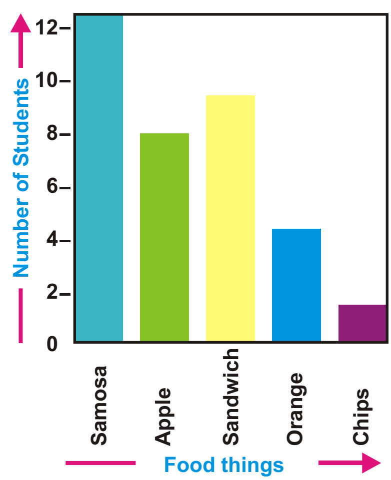
Step 1: Select the ages on vertical side and family members on horizontal side of the graph.

Step 2: Colour the columns to show the information.

Read and interpret a simple bar graphs given in horizontal and vertical form.

Activity **Read the vertical bar graph and write the correct answer in the box.**

This bar graph represents information about students as to what they ate at play time in school. The different food things are shown on horizontal line and number of students are shown on vertical line.



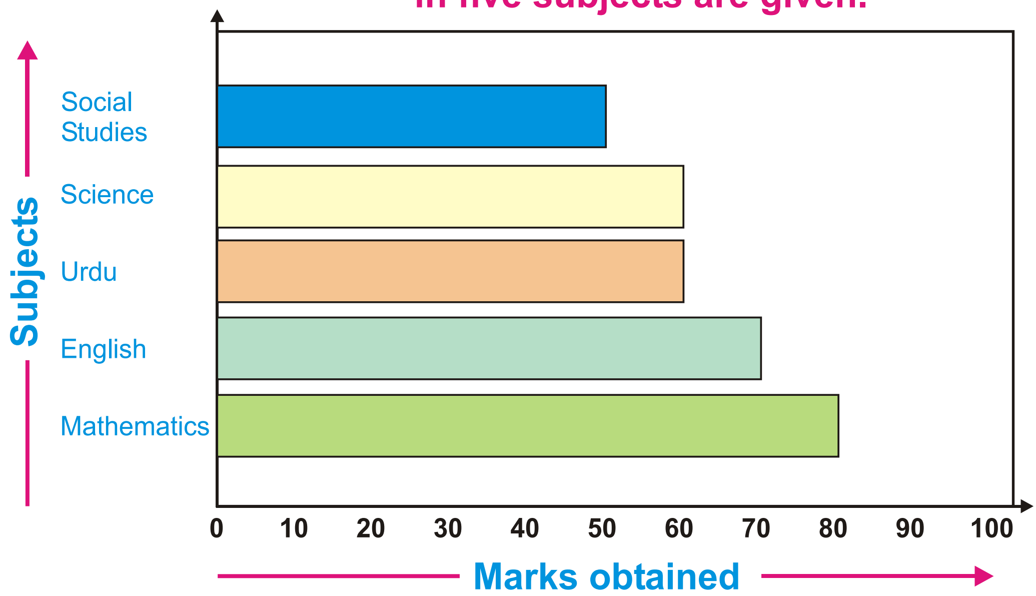
Answer the following questions.

(1) How many children ate samosa? **12**
(2) How many children ate oranges? ☐
(3) How many children ate apples? ☐
(4) How many children ate sandwiches? ☐
(5) How many children ate chips? ☐



Activity

Read the following horizontal bar graph. In this graph, the marks obtained by Yasir of Grade V in five subjects are given.



Read the horizontal bar graph and answer the following questions:

(i) How many marks did Yasir get in English? 70

(ii) How many marks did he get in Urdu?

(iii) How many marks did he get in Mathematics?

(iv) How many marks did he get in Science?

(v) How many marks did he get in Social studies?

(vi) In which subjects did he got the least number of marks?

(vii) How many total marks did he get?

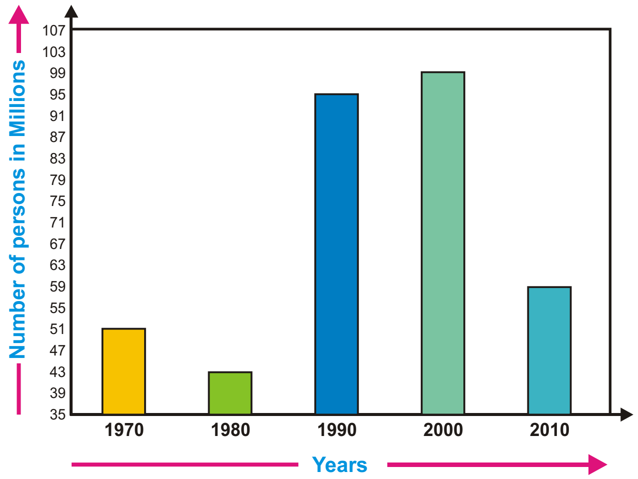
(viii) In which subject did he get the highest marks?

(ix) Which subjects he get equal marks?



The following bar graph shows the number of illiterate persons of a country in different years.

Time in years is shown on horizontal axis. The number in millions is shown on vertical axis.



Read the vertical bar graph and answer the following questions:

(i) How many illiterate persons were there in 1990? 95 millions

(ii) In which year was number of illiterate persons highest?

(iii) What was the number of illiterate persons in 1980?

(iv) How many illiterate persons were in 2010?

(v) In which year was the number of illiterate persons the least?

(vi) How many illiterate persons were in 2005?

(vii) How many illiterate persons were in 1995?

(viii) How many illiterate persons were in 1985?

(ix) In which year the number of illiterate persons was 50 millions?

EXERCISE 9.3

1. Draw a block graph or column graph of the following:

(i) Attendance of Faraz's class during a week.

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Children	32	35	30	30	25	20

(ii) Result of examination of class V.

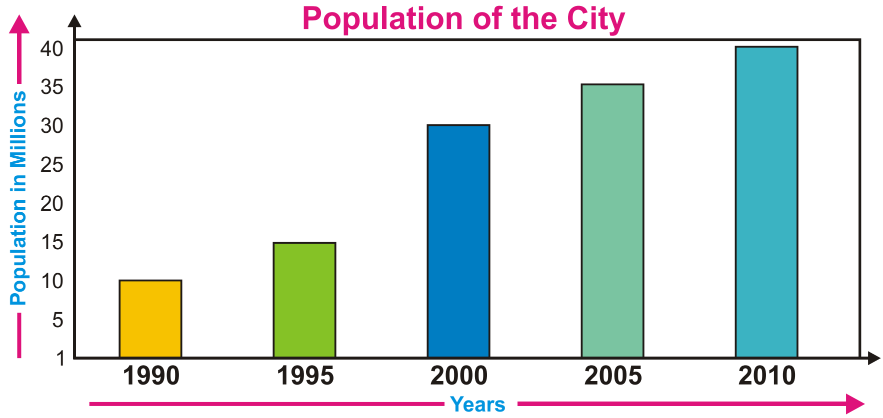
Grade	A1	A	B	C	D
No. of Children	20	25	15	20	5

(iii) The marks obtained by Amjad during annual examination.

Subject	Islamiyat	English	Urdu	Maths	S.Studies	Science
Marks Obtained	80	50	65	90	40	55

2. The population of Dadu city is represented in the following bar graph.

Years are shown on horizontal axis.
Population in millions is shown on vertical axis.

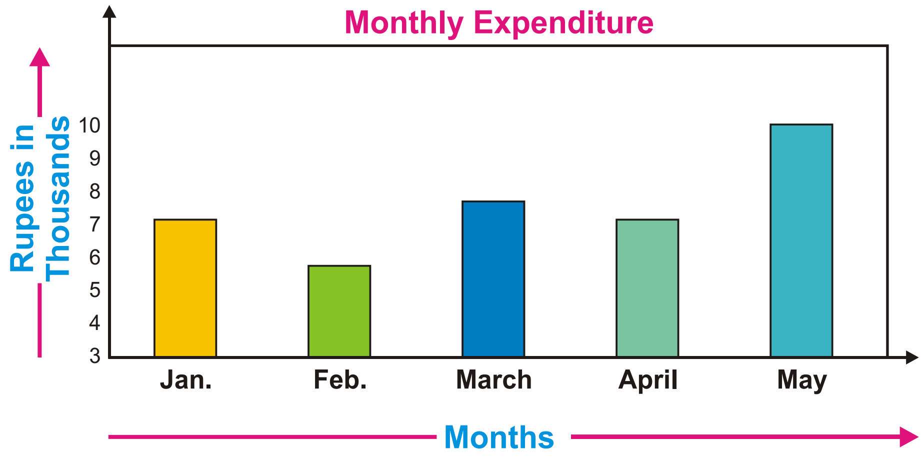


Read the graph and answer the following questions:

(i) What was the population of the city in 1995? ☐
(ii) What was the population of the city in 2000? ☐
(iii) What was the population of the city in 2005? ☐
(iv) In which year the population was least? ☐
(v) In which year the population was highest? ☐
(vi) Read and prepare the chart from the graph.

3. **The expenditure of a family for five months is reported by the following bar graph.**

Names of months are shown on horizontal axis.
Amount in thousand rupees is shown on vertical axis.



Look at the graph and answer the following questions:

(i) In which month expenditure was the least?

(ii) In which month the expenditure was the greatest?

(iii) What was the expenditure in the month of February?

(iv) What was the expenditure in the month of April?

(v) In which months the expenditure is equal?

(vi) In which month the expenditure is Rs 8000?

(vii) What is the amount of highest expenditure?

(viii) What is the amount of lowest expenditure?

Define and organize data.

(a) Definition of Data

The information collected from any field of study is called data. Mostly it is represented in the form of numerical figures.

Data can be obtained from existing source or the same can be obtained directly from the target according to needs.

Example: Favourite colour of class IV students, different age groups in class V, marks obtained by some one in an examination, any office record, game records; etc.

(b) Organizing Data

There are many ways of collecting and organizing data.

Data can be represented through pictures, tables, charts and graphs.

Example: The organizer of a market survey wants to know the ages of the customers.

Solution:

The ages of customers are:

17, 12, 15, 20, 25, 17, 19, 11, 12,
15, 20, 20, 12, 20, 22, 20, 19, 15

This way of representing the information does not help the organizer to answer any question.

Now we write the above information in ascending order:

11, 12, 12, 12, 15, 15, 15, 17, 17,
19, 19, 20, 20, 20, 20, 20, 22, 25

Table (i)

Teacher's Note Teacher should help the students to develop the concept of data and of organizing different data. He/she should give them tasks to collect and represent different data from their surroundings.

Though it is one way but it is time taking. There is possible that some data may be missed. However, it is easier to read data.

Now we organize the data in another way through tally method.

Age of customers in years	Tally marks	Number of customers
11	|	1
12	|||	3
15	|||	3
17	||	2
19	||	2
20	~~||||~~	5
22	|	1
25	|	1

Table (ii)

The organizer now read the ages one by one from Table (i) and draws one small line called tally in the tally column against the age read in table (ii). If a number occurs five times he crosses the four tallies already drawn by a slash like this (~~||||~~). Thus (~~||||~~) stands for five numbers. Then counts the tallies and write the numbers in the last column shown in table.

Example:

The mathematics marks of class V students are as under:

organize the data

32, 30, 31, 33, 33, 34, 34, 33, 32, 32, 34, 35, 35, 32, 33, 32, 31, 33, 32

Solution:

Now we write the above information in ascending order:

30, 31, 31, 32, 32, 32, 32, 32, 32, 33, 33, 33, 33, 33, 34, 34, 34, 35, 35

The data is represented through tally chart.

Marks obtained	Tally	No. of students
30	|	1
31	||	2
32	~~||||~~ |	6
33	~~||||~~	5
34	|||	3
35	||	2

Activity

Organize the following information through tally method. The ages of students of class V in a school are given in the following table:

Ages of students in years										
	11	12	11	13	10	11	13	12	13	14
	12	13	11	11	14	10	12	12	11	13

Solution: Writing the above information in ascending order:

Ages of students in years										
	10		11						12	
				13					14	

Organize the given data through tally method

Ages of students in years	Tally	No. of same ages of students
10		
11		
14		

EXERCISE 9.4

Organize the following survey information through tally method.

1. The pocket money of students of Class V is found as: Rs 30, Rs 40, Rs 50, Rs 40, Rs 50, Rs 60, Rs 50, Rs 40, Rs 70, Rs 60, Rs 50, Rs 40, Rs 30, Rs 40 and Rs 50.

2. The heights of students of Class V in a school are noted as: 110 cm, 115 cm, 100 cm, 105 cm, 104 cm, 110 cm, 108 cm, 100 cm, 100 cm, 105 cm, 110 cm, 104 cm, 105 cm, 100 cm, 115 cm, 105 cm, 110 cm, 105 cm, 100 cm and 105 cm.

3. The attendance of 20 days of class V students are: 15, 18, 16, 17, 18, 17, 18, 17, 16, 15, 16, 17, 18, 18, 17, 16, 18, 17, 16 and 17.

4. A gardener planted different numbers of plants in 18 days as under:
2, 1, 3, 5, 6, 3, 2, 3, 1, 2, 3, 4, 3, 2, 5, 5, 2 and 3.

5. The number of patients daily checked by doctor in 15 days are: 35, 40, 36, 35, 35, 40, 37, 35, 40, 38, 35, 40, 39, 40 and 35.

6. A team played 6 matches. The score was 210, 189, 180, 205, 175 and 165 runs respectively. What is the average score?

7. The enrolment of a school is 460 students. If there are 8 class rooms, what is the average of students in each class room?

REVIEW EXERCISE 9

1. Find the average of following numbers:
   (i) 4, 3, 5, 8, 5, 10.
   (ii) 10, 20, 30, 40, 50

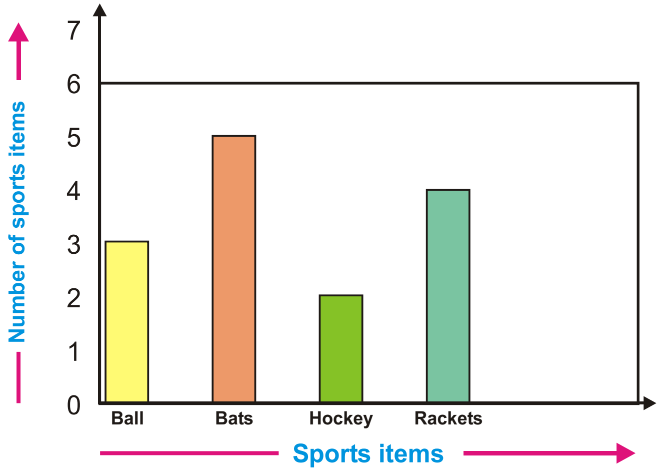
2. The six hours journey of a person on car is given below.

Hours	1	2	3	4	5	6
Distance in kilometres	20	18	20	22	16	18

   What is the average distance covered per hour?

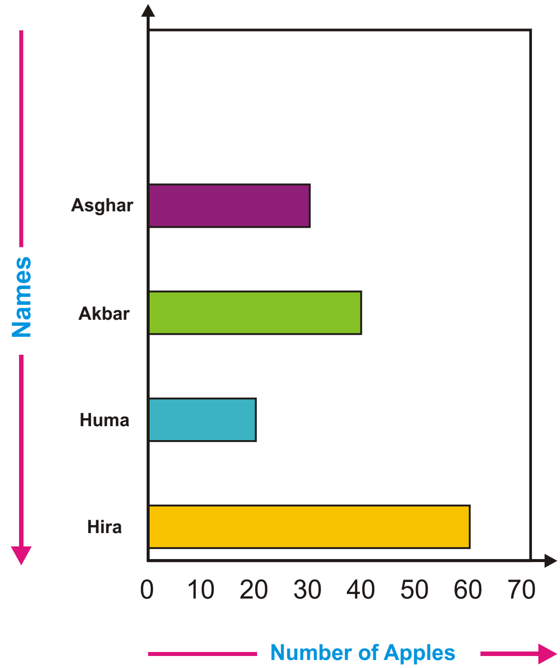
3. A batsman made **160** runs in two innings. Find the average runs he made in each innings.

4. Read the graph and answer the following questions.



   (i) How many balls are there? ☐
   (ii) How many bats are there? ☐
   (iii) How many hockey are there? ☐
   (iv) How many rackets are there? ☐
   (v) How many balls and bats are there? ☐
   (vi) How many bats and rackets are there? ☐

5. Interpret following vertical bar graph.



(i) How many apples does Asghar have? ☐

(ii) How many apples does Akbar have? ☐

(iii) How many apples does Huma have? ☐

(iv) How many apples does Hira have? ☐

(v) How many apples do Asghar and Akbar have? ☐

(vi) How many apples do Huma and Hira have? ☐

6. Fill in the blanks.

(i) The average of 5, 15, 30, 10 and 20 is ____________

(ii) The average of 20, 40, 30 and 35 is ______________

(iii) When we choose a suitable symbol to represent each part of information, we will use ________ graph.

GLOSSARY

Acute angle: An angle which is less than 90°.

Acute angled triangle: A triangle which has one of its angle acute angle.

Adjacent angles: Two angles with a common vertex and a common arm are called adjacent angles.

Angle: The amount of turning between two arms about a common point.

Arc: A part of a circle.

Area: The space occupied within the boundary of a shape is called an area.

Associative property addition: The property that when any three numbers (fractions) are added in any order, their sum is always the same.

Associative property multiplication: The property when any three numbers (fractions) are added in any order, their sum is always the same.

Average: The quantity that represents the given quantities.

Bar graph: It represents each part of the information in the form of bars (vertical or horizontal).

Block graph: The graph in which we choose a suitable symbol to represent each part of the information.

Capacity: The amount of liquid a container can hold.

Centimetre: A unit of length, 100 centimetres (cm) = 1 metre (m)

Circle: A plane shape bounded by a single curved line where all of its points are at equal distance from a fixed point.

Commutative property of Multiplication: The property that any two numbers when multiplied to each other in any order, their product is always same.

Commutative property of addition: The property that when any two numbers (fractions) are added in any order their sum is always same.

Complementary angles: Two angles whose sum of the measures is equal to 90°.

Data: Information presented in the form of numbers.

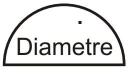
Decimal: Any number containing a fractional part indicated by a decimal point is called decimal number or decimal.

Decimal fraction: A common fraction with a denominator as 10,000, written with a decimal point.

GLOSSARY

Denominator: Lower number of the common fraction.

Diametre: A half circle's line segment is called diametre of the circle



Direct proportion: The relationship between two ratios in which increase in one quantity causes a proportional increase in the other quantity and decrease in one quantity causes a improportional decrease in the other quantity.

Dividend: A number is to be divided by another number, till we get less number than the divisor.

Divisibility: A division in which when a number is divided by another, the remainder is zero.

Divisor: A number which can divide the other number exactly.

Edge: A one dimensional line segment joining two vertices.

Equivalent fraction: The fractions that have the same value.

Equilateral triangle: A triangle in which all the three sides are equal in length.

Factors: The divisor of a number.

Factorization: A number represented as a product of its factors.

Fraction: Part of a whole.

Gram: Unit of mass.

Graph: A pictorial representation of a data.

GCD: Greatest Common Divisor.

Hours: 24^{th} part of the day, 60 minutes. A unit of time

1 hour = 60 minutes

HCF: Highest Common Factor.

Inverse proportion: The relationship between the two ratios in which increase in one quantity causes a proportional decrease in the other quantity and a decrease in one quantity causes a proportional increase in the other quantity.

Isosceles triangle: A triangle with its two sides equal in length.

Kilogram: A unit of mass. 1 kilogram (kg) = 1000 grams (g)

L.C.M Least Common Multiple.

Like decimals: The decimals having same number of decimal places.

Like fractions: Fraction having same denominator.

Line: A B This figure represents a line AB.

Line segment: Shortest distance between two points. A B

Litre: Unit of volume/capacity 1 litre (ℓ) = 1000 millilitres ($m\ell$)

Lunar Calendar: (Hijrah Qamri Calendar) Islamic Calendar in a solar year.

Mass: Quantity of matter present in a body.

Millilitre: Thousandth part of a litre.

Millimetre: Thousandths part of a metre.

Million: The smallest seven digit number i.e. 1,000,000 (Ten hundred thousand).

Minute: Sixtieth part of an hour. **1 minute = 60 seconds**

Mixed fraction: A fraction contains both a whole number and a proper common fraction.

Month: A unit of time. **1 month = 30 days**

Numerator: Upper number of common fraction.

Obtuse angle: An angle which is more than 90°.

Obtuse angled triangle: A triangle which has one of its angles obtuse angle.

Percentage: The word percent is a short form of the Latin word "Percentum". Percent means out of hundred or per hundred.

Perimeter: The distance along the sides of a closed shape.

Prime factorization: A factorization in which every factor is a prime factor.

Proper fraction: A fraction whose numerator is less than the denominator.

Proportion: The quality of two ratios.

Quadrilateral: A four sided closed figure.

Quotient: The number shows how many times the divisor has been repeatedly subtracted.

Ratio: A comparison of two quantities of the same kind.

Radius: The distance from the centre of the circle to the boundary of the circle.

Ray: An arrow mark on one end point of a line segment



Rectangle: A quadrilateral whose opposite sides are equal and have four right angles.

Reflex angle: An angle of measure greater than 180°.

Remainder: The number left over when one integer is divided by another.

Right angle: An angle whose measure is 90°.

Right angled triangle: A triangle which has one of its angle of the measure 90°.

Round off decimals: To round off a decimal nearest to the whole number, check the first decimal place and accordingly round off the number.

Scalene triangle: A triangle whose all sides are of different measures.

Second: Unit of time, $\frac{1}{60}$ the part of a minute.

Solar Calendar: In this calendar, the dates indicates the position around the sun (365 days in a year).

Square: A quadrilateral whose all four sides are equal and has four right angles.

Straight angle: An angle whose measure equals to 180°.

Subtraction: Symbol (–). The process of finding the difference between two numbers/quantities.

Supplementary angles: Two angles whose sum of the measures is equal to 180°.

Symbol: A sign used to represent an operation, element or relation.

Temperature: It is a measure how much cold or hot a body or a substance is.

Triangle: A three sided closed figure.

Unit fraction: Numerator is equal to the denominator.

Unitary method: The process of finding the price of one (unit) item, from which we find the price of a number of similar items.

Unlike decimals: The decimals having different number of decimal places.

Unlike fractions: Fractions whose denominators are not same.

Vertex: An angular point of any shape.

ANSWERS

EXERCISE 1.1

A. (1) 45,672 (2) 2,670,273 (3) 34,296,127 (4) 100,000,000
(5) 9,923,456,310 (6) 6,123,450,238

B. (1) Sixty six millions, Six hundred fifty five thousands and five hundred twenty two.
(2) Ninety six millions, three hundred forty thousands and five hundred twenty nine.
(3) Two hundred forty five millions, six hundred seventy two thousands and three hundred sixteen.
(4) One hundred millions.
(5) Four billions, nine hundred twelve millions, three hundred ninety eight thousands and eight hundred sixty six.
(6) One billion, eight hundred thirty three millions, three hundred eighty seven thousands and seven hundred fifty four.

C. (1) 1,002,600 (2) 9,099,077 (3) 58,862,045
(4) 1,000,000,000 (5) 7,000,000,000 (6) 9,000,000,000
(7) 6,096,049,608 (8) 2,345,671,806

D.

M	H-th	T-th	Th	H	T	O
2	0	3	5	7	5	4

So, the number in words:
Two millions, Thirty five thousands and Seven hundred fifty four.

EXERCISE 1.2

A. (1) 981,802 (2) 4,632,048 (3) 8,623,037 (4) 7,051,459
(5) 4,531,777 (6) 6,097,173 (7) 8,928,449 (8) 3,640,193
(9) 9,500,950 (10) 37,314,112 (11) 79,613,418 (12) 789,451,507

B. (1) 1,243,731 (2) 3,773,535 (3) 40,811,696 (4) 88,856,946
(5) 905,347,265 (6) 921,490,114

EXERCISE 1.3

A. (1) 2698782 (2) 5240309 (3) 3200104 (4) 2046948
(5) 49918102 (6) 57095640

B. (1) 386121 (2) 2911201 (3) 920927 (4) 38151829
(5) 53905409 (6) 521889785

ANSWERS

EXERCISE 1.4

A.	(1) 41360	(2) 345690	(3) 210340	(4) 1534700
	(5) 2779600	(6) 15543000	(7) 41357000	(8) 386975000
B.	(1) 97100	(2) 5086240	(3) 1792560	(4) 29428650
	(5) 2562000	(6) 168549000		
C.	(1) 852687	(2) 20934034	(3) 4890300	(4) 43038336
	(5) 1680602	(6) 13135892	(7) 18538128	(8) 36112216
	(9) 5471025	(10) 609922660	(11) 173941344	(12) 734222849
	(13) 140699670	(14) 522851472	(15) 280170566	(16) 384251808

EXERCISE 1.5

A.	(1) 8965	(2) 5568	(3) 6589	(4) 9608
	(5) 562	(6) 659	(7) 1377	(8) 568

B.
(1) remainder = 8, quotient = 567
(2) remainder = 5, quotient = 39678
(3) remainder = 5, quotient = 4734
(4) remainder = 16, quotient = 8432
(5) remainder = 6, quotient = 52301
(6) remainder = 879, quotient = 8256
(7) remainder = 782, quotient = 6456
(8) remainder = 0, quotient = 9650

EXERCISE 1.6

(1) 199624 rupees
(2) Rs 2700
(3) Rs 114 by each student
(4) 7545792 marbles
(5) Rs 134502500
(6) 3354150 litres
(7) 11815 rolls required
(8) Rs 2434372

EXERCISE 1.7

(1) 18	(2) 3	(3) 26	(4) 666
(5) 162	(6) 34	(7) 288	(8) 27
(9) 6	(10) 114	(11) 10	(12) 1
(13) 15	(14) 549	(15) 4500	(16) 204

EXERCISE 1.8

B.	(1) 5, 3	(2) 32, 32	(3) 30, 40	(4) +, x
	(5) 5, +	(6) 5, 13		

ANSWERS

REVIEW EXERCISE 1

1. (i) Two hundred forty six millions, four hundred sixteen thousands and two hundred seventy nine.
   (ii) Nine hundred five millions, four hundred seven thousands and six hundred eight.

2. (i) 75,026,420 (ii) 405,745,806
3. (i) 211,029,597 (ii) 24,137,404 (iii) 737,718,214
4. (i) 211,678,206 (ii) 616,236,553 (iii) 407,288,461
5. (i) 12,430 (ii) 43,305,525 (iii) 2,269,160 (iv) 589,107,636 (v) 405,617,000
6. (i) remainder = 10, quotient = 25113 (ii) remainder = 325, quotient = 757
7. (i) 450 (ii) 26
9. 858935 litres
10. 800 boxes

EXERCISE 2.1

A. (1) 4 (2) 9 (3) 8 (4) 14
(5) 22 (6) 26 (7) 20 (8) 16
(9) 7 (10) 13 (11) 15 (12) 7

B. (1) 14 (2) 22 (3) 19 (4) 17
(5) 16 (6) 18 (7) 20 (8) 12
(9) 16 (10) 15 (11) 14 (12) 9

EXERCISE 2.2

A. (1) 108 (2) 165 (3) 156 (4) 240
(5) 432 (6) 3600 (7) 1176 (8) 396
(9) 150 (10) 450 (11) 160 (12) 432

B. (1) 48 (2) 100 (3) 144 (4) 540
(5) 1260 (6) 192 (7) 1080 (8) 3960
(9) 240 (10) 96 (11) 540 (12) 240

EXERCISE 2.3

(1) 600 (2) 6 (3) 30 days (4) 105
(5) 60 hours (6) 36 cm (7) 16 cm (8) 600 litres
(9) 180 cm (10) Packets of 6 pencils and 5 erasers

REVIEW EXERCISE 2

1. (i) a (ii) d (iii) b (iv) c (v) c
2. 24
3. 6
4. 60 apples
5. 5 metres
6. 600 litres

ANSWERS

EXERCISE 3.1

A. (1) $\frac{5}{6}$ (2) $\frac{7}{8}$ (3) $\frac{11}{15}$ (4) $\frac{17}{24}$ (5) $\frac{35}{16}$ (6) $\frac{29}{35}$

B. (1) $\frac{29}{45}$ (2) $\frac{13}{45}$ (3) $\frac{13}{48}$ (4) $2\frac{8}{20}$ (5) $4\frac{27}{60}$ (6) $2\frac{31}{96}$

C. (1) $\frac{5}{12}$ (2) $\frac{1}{4}$ (3) $\frac{1}{3}$ (4) $\frac{1}{3}$ (5) 3 (6) $6\frac{1}{10}$

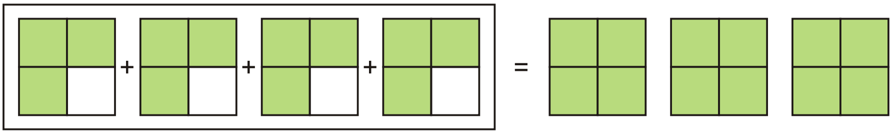
D. (1) $\frac{7}{24}$ (2) $\frac{1}{4}$ (3) $\frac{2}{7}$ (4) $\frac{1}{4}$ (5) $\frac{1}{2}$ (6) $1\frac{1}{5}$

(7) $\frac{5}{9}$ (8) $\frac{2}{3}$ (9) $\frac{1}{2}$

E. (1) $\frac{7}{10}$ (2) $\frac{1}{2}$ (3) $\frac{11}{42}$ **F.** (1) $\frac{1}{12}$ (2) $\frac{7}{15}$ (3) $\frac{1}{20}$

EXERCISE 3.2

A. (1)



So, $\frac{3}{4} \times 4 = 3$

(2) 1 (3) 3 (4) 1 (5) 2 (6) 2 (7) 2 (8) 4 (9) 6

Note: Compare the answer with drawn figures.

B. (1) $\frac{1}{10}$ (2) $\frac{3}{20}$ (3) $\frac{2}{9}$ (4) $\frac{15}{16}$ (5) $1\frac{13}{15}$ (6) $5\frac{1}{4}$

C. (1) $\frac{2}{3}$ (2) $2\frac{1}{2}$ (3) $1\frac{1}{2}$ (4) $3\frac{1}{15}$ (5) $5\frac{5}{12}$ (6) $11\frac{1}{9}$

EXERCISE 3.3

(1) 6 (2) 2 (3) 3 (4) 4 (5) 4 (6) 5

(7) 25 (8) 14 (9) 4 (10) 10 (11) $12\frac{1}{2}$ (12) $2\frac{1}{2}$

EXERCISE 3.5

(1) $\frac{1}{3}$ metres (2) 45 students (3) 8 drips (4) 20 kg

(5) Rs 1482 (6) $1\frac{4}{5}$ metres (7) 20 litres (8) 18 metres

(9) Rs 620 (10) 110 metres

ANSWERS

EXERCISE 3.6

A.
(1) $\frac{1}{2}$ (2) $\frac{1}{4}$ (3) 3 (4) 5 (5) 10
(6) $\frac{4}{3}$ (7) $\frac{7}{20}$ (8) $\frac{5}{13}$ (9) $\frac{3}{7}$ (10) $\frac{3}{14}$

B.
(1) $\frac{3}{5}$ (2) $\frac{1}{6}$ (3) $\frac{1}{8}$ (4) $\frac{1}{10}$ (5) $\frac{1}{12}$ (6) $\frac{1}{15}$
(7) $\frac{1}{16}$ (8) $\frac{1}{27}$ (9) $\frac{1}{15}$ (10) $\frac{1}{18}$ (11) $\frac{1}{25}$ (12) $\frac{2}{3}$

EXERCISE 3.7

(1) $\frac{2}{3}$ (2) $2\frac{5}{8}$ (3) $\frac{4}{5}$ (4) $\frac{2}{9}$ (5) 2
(6) 1 (7) $1\frac{1}{3}$ (8) $\frac{1}{2}$ (9) $\frac{5}{9}$ (10) $\frac{44}{57}$
(11) $2\frac{3}{7}$ (12) $1\frac{31}{35}$ (13) $4\frac{12}{45}$ (14) $3\frac{1}{2}$ (15) $2\frac{22}{171}$

EXERCISE 3.8

(1) Rs 20 (2) 7 cars (3) 28 pieces (4) 7 servings
(5) $25\frac{1}{4}$ metres (6) $5\frac{1}{2}$ metres (7) 33 bottles (8) $3\frac{1}{2}$ km

EXERCISE 3.9

(1) $\frac{113}{168}$ (2) $41\frac{1}{3}$ (3) $1\frac{5}{66}$ (4) $3\frac{5}{6}$ (5) $\frac{5}{8}$
(6) $1\frac{13}{56}$ (7) $3\frac{17}{27}$ (8) $3\frac{20}{27}$ (9) $\frac{11}{105}$

REVIEW EXERCISE 3

1.
(i) T (ii) T (iii) F (iv) T
(v) T (vi) T (vii) T (viii) T

2.
(i) Rs $10\frac{3}{20}$ (ii) Afzal got $\frac{1}{10}$ more (iii) Rs 300
(iv) $\frac{3}{8}$ m left (v) 202 packets (vi) 800 tickets

ANSWERS

EXERCISE 4.1

A.

(1) 28.78	(2) 40.967	(3) 99.67	(4) 257.253
(5) 47.443	(6) 97.475	(7) 1131.84	(8) 711.047
(9) 100.44	(10) 295.357	(11) 322.826	(12) 911.565

B.

(1) 19.22	(2) 41.165	(3) 51.13	(4) 256.753
(5) 42.103	(6) 605.78	(7) 441.08	(8) 638.087
(9) 31.1	(10) 113.044	(11) 611.11	(12) 130.325

EXERCISE 4.2

A. 0.08, 34.25, 3.36, 52.30, 38.66

B.

(1) 1.75	(2) 17.5	(3) 175	(4) 350.58
(5) 3505.8	(6) 35058	(7) 81.5	(8) 815
(9) 8150	(10) 3244.23	(11) 32442.3	(12) 324423
(13) 0.067	(14) 0.67	(15) 6.7	

EXERCISE 4.3

(1) 0.6675	(2) 0.06675	(3) 0.006676	(4) 3.589
(5) 0.3589	(6) 0.03589	(7) 81.54	(8) 8.154
(9) 0.8154	(10) 0.0085	(11) 0.00085	(12) 0.000085

EXERCISE 4.4

B.

(1) 3.25	(2) 32.5	(3) 3.9	(4) 21
(5) 2.8	(6) 29.75	(7) 34	(8) 38.25
(9) 1.91	(10) 3.152	(11) 172.06	(12) 48321
(13) 114.75	(14) 9.54	(15) 1211.475	(16) 688.5
(17) 16469.448	(18) 33257.388		

EXERCISE 4.5

A.

(1) 0.13	(2) 1.3	(3) 0.013	(4) 0.6
(5) 0.08	(6) 0.61	(7) 1.2	(8) 4.9
(9) 0.077	(10) 1.399	(11) 5.693	(12) 9.67

B.

(1) 0.894	(2) 14.94	(3) 32.86	(4) 2.425
(5) 0.013	(6) 0.111	(7) 7.299	(8) 3.052
(9) 174.096			

EXERCISE 4.6

(1) 0.26	(2) 0.774	(3) 12.75	(4) 23.98
(5) 0.15	(6) 0.006	(7) 0.44	(8) 0.21
(9) 0.078	(10) 0.003	(11) 0.0001	(12) 0.088
(13) 0.2322	(14) 2.125	(15) 4.1965	

EXERCISE 4.7

A.

(1) 56.04	(2) 0.9048	(3) 4.284	(4) 81.84	(5) 17.8068
(6) 0.4824	(7) 1279.356	(8) 548.1025	(9) 925.934	

B.

(1) 0.112	(2) 0.225	(3) 0.0046	(4) 0.014
(5) 0.01625	(6) 0.0006	(7) 0.0016	(8) 0.945
(9) 0.01612	(10) 0.01254	(11) 0.0125	(12) 0.1057

C.

(1) 3.5	(2) 2.73	(3) 2.66	(4) 0.603
(5) 8.01	(6) 13.26	(7) 44.304	(8) 23.1
(9) 18.33	(10) 49.83	(11) 213.18	(12) 72.22

EXERCISE 4.8

A.

(1) 3.6	(2) 24	(3) 14.7	(4) 112
(5) 0.547	(6) 1.09	(7) 56	(8) 112
(9) 128	(10) 27.16	(11) 2502	(12) 57

B.

(1) 0.08	(2) 0.6	(3) 0.6	(4) 0.09
(5) 0.11	(6) 0.013	(7) 2.4	(8) 1.131
(9) 0.03	(10) 1.193	(11) 0.012	(12) 0.6
(13) 25.6	(14) 1.3	(15) 0.014	

EXERCISE 4.9

(1) 1.25	(2) 1.666	(3) 0.8	(4) 0.7
(5) 2.142	(6) 1.555	(7) 0.625	(8) 2.555
(9) 4.571	(10) 3.461	(11) 3.333	(12) 0.642
(13) 0.687	(14) 0.416	(15) 0.85	(16) 2.083
(17) 9.423	(18) 31.25	(19) 1.2	(20) 0.92

EXERCISE 4.10

(1) 5.9	(2) 123.7175	(3) 34.06	(4) 16.63	(5) 6.015
(6) 79.38	(7) 46.196	(8) 26.382	(9) 21.454	(10) 194.711

ANSWERS

EXERCISE 4.11

A.

(1) 2	(2) 6	(3) 8	(4) 7	(5) 10	(6) 8
(7) 8	(8) 50	(9) 59	(10) 78	(11) 82	(12) 100

B.

(1) 32.4	(2) 25.2	(3) 6.2	(4) 6.4
(5) 76.8	(6) 95.2	(7) 12.9	(8) 6.0
(9) .3.4	(10) 11.8	(11) 50.5	(12) 60.2

C.

(1) 32.39	(2) 25.06	(3) 6.78	(4) 6.42
(5) 76.80	(6) 8.48	(7) 0.96	(8) 58.19
(9) 4.01	(10) 40.98	(11) 70.49	(12) 19.02

EXERCISE 4.12

A.

(1) 0.875	(2) 0.9	(3) 0.4	(4) 0.68
(5) 1.22	(6) 0.95	(7) 1.225	(8) 0.8875
(9) 0.902	(10) 0.316	(11) 0.83	(12) 0.2775
(13) 0.97125	(14) 0.551	(15) 0.0999	

B.

(1) $\frac{1}{2}$	(2) $1\frac{1}{20}$	(3) $3\frac{14}{25}$	(4) $\frac{113}{200}$	(5) $\frac{23}{1000}$	(6) $\frac{1}{4}$
(7) $\frac{69}{200}$	(8) $35\frac{253}{500}$	(9) $\frac{8}{125}$	(10) $\frac{189}{200}$	(11) $41\frac{5}{8}$	(12) $46\frac{64}{625}$

EXERCISE 4.13

(1) 3.135 kg weight	(2) 102.25 kg more	(3) 11.44 g total
(4) Rs 31993.25	(5) Rs 70372.50	(6) 89.58 m wire
(7) 12.50 m left	(8) 7 dresses	(9) 0.12 kg per day
(10) Rs 156.50		

EXERCISE 4.14

A.

(1) 0.25	(2) 0.3	(3) 0.35	(4) 0.4
(5) 0.65	(6) 0.7	(7) 0.8	(8) 0.85
(9) 0.95	(10) 0.99	(11) 1.05	(12) 1.15

B.

(1) $\frac{4}{5}$, 80%	(2) $\frac{17}{50}$, 34%	(3) $\frac{14}{25}$, 56%	(4) $\frac{63}{100}$, 63%
(5) $\frac{11}{20}$, 55%	(6) $\frac{33}{50}$, 66%	(7) $3\frac{9}{20}$, 345%	(8) $3\frac{3}{5}$, 360%
(9) $5\frac{1}{2}$, 550%	(10) $2\frac{1}{20}$, 205%	(11) $25\frac{1}{2}$, 2550%	(12) $55\frac{1}{4}$, 5525%

C. (1) 80% (2) 24% (3) 55% (4) 62.5%
(5) 42.5% (6) 41.6% (7) 31.6% (8) 56.6%
(9) 142% (10) 180%

EXERCISE 4.15

(1) 216 boys (2) 495 students (3) 630 employees (4) 1586 houses
(5) 240 students (6) 90 cars (7) Rs 1501.50

REVIEW EXERCISE 4

A. (1) 100 (2) 100 (3) 0.65 (4) 4.444 (5) 4.95

B. (1) 0.016, 0.463, 1.995, 2.087 (2) 5.661 (3) 10.09 m higher (5) 0.6

C. (1) 4 dresses (2) 1680 marks (3) (i) 15.75 (ii) 3.42 (iii) 242 (iv) 11

EXERCISE 5.1

A. (1) 1 km 600 m (2) 2 km 483 m (3) 1 km 386 m
(4) 6 km 34 m (5) 8 km 324 m (6) 7 km 945 m

B. (1) 4 m (2) 7 m 50 cm (3) 3 m 85 cm (4) 8 m 10 cm
(5) 2 m 5 cm (6) 5m 67 cm (7) 6 m 84 cm (8) 9 m 98 cm

C. (1) 3 m 5 mm (2) 63 cm 4 mm (3) 59 cm 3 mm (4) 40 cm
(5) 29 cm 5mm (6) 44 cm 7 mm (7) 60 cm 9 mm (8) 89 cm 9 mm

D. (1) 8000 m (2) 20340 m (3) 1500 cm (4) 2545 cm
(5) 350 mm (6) 1 km 2 m (7) 3 km 785 m (8) 15 m 2 cm
(9) 85 cm (10) 472 cm 5 mm

E. (1) 7m (2) 8 m (3) 9 m (4) 4 m
(5) 1 m (6) 5 m (7) 6 m (8) 100 m

EXERCISE 5.2

A. (1) 109 km 72 m (2) 685 m 44 cm (3) 8 km 80 m
(4) 14 m 30 cm (5) 5 km 242 m (6) 111 cm 5 mm
(7) 16 km 180 m (8) 14 m 22 cm

B.
(1) 8 km 91 m
(2) 56 km 3 m
(3) 1 km 742 m
(4) 23 cm 5 mm
(5) 2 km 420 m
(6) 22 m 37 cm
(7) 2 km 805 m
(8) 5 cm 3 mm

EXERCISE 5.3

(1) 3 m 92 cm ribbon left
(2) 1 km 457 m total distance
(3) 79 cm space left
(4) Railway station, 129 m
(5) 12 cm 2 mm length
(6) 117 m ahead
(7) 116 km drive
(8) 1 m 5 cm tall

EXERCISE 5.4

A.
(1) 120 minutes
(2) 480 minutes
(3) 720 minutes
(4) 1620 minutes
(5) 1740 minutes
(6) 2040 minutes

B.
(1) 300 seconds
(2) 600 seconds
(3) 1200 seconds
(4) 2700 seconds
(5) 3300 seconds
(6) 3600 seconds
(7) 4500 seconds
(8) 5100 seconds

C.
(1) 19 hours 40 minutes
(2) 20 hours 50 minutes
(3) 24 hours 50 minutes
(4) 37 hours 5 minutes
(5) 30 hours 15 minutes
(6) 39 hours 35 minutes

D.
(1) 36 minutes 25 seconds
(2) 4 minutes 35 seconds
(3) 5 minutes 50 seconds
(4) 11 minutes 50 seconds
(5) 16 minutes 30 seconds
(6) 23 minutes 15 seconds

E.
(1) 1 hour 3 minutes 20 seconds
(2) 1 hour 8 minutes 20 seconds
(3) 1 hour 12 minutes 40 seconds
(4) 1 hour 16 minutes 35 seconds
(5) 1 hour 18 minutes 45 seconds
(6) 1 hour 21 minutes 55 seconds

EXERCISE 5.5

A.
(1) 51 minutes 20 seconds
(2) 67 minutes 14 seconds
(3) 8 hours 37 minutes
(4) 7 hours 15 minutes 16 seconds
(5) 6 hours 4 minutes 29 seconds

B.
(1) 13 minutes 51 seconds
(2) 5 minutes 35 seconds
(3) 7 minutes
(4) 2 hours 28 minutes
(5) 1 hour 44 minutes 50 seconds

ANSWERS

EXERCISE 5.6

(1) 6 weeks 4 days
(2) 11 weeks 3 days
(3) 30 weeks 3 days
(4) 334 weeks 5 days
(5) 15 months
(6) 26 months 20 days
(7) 23 months 20 days
(8) 21 months 20 days
(9) 5 years 6 months
(10) 6 years 10 months
(11) 4 years 1 month
(12) 20 years 4 months

EXERCISE 5.7

(1) Ali plays 20 minutes shorter
(2) 2 hours 10 minutes
(3) 3 months 20 days
(4) 2 hours 26 minutes
(5) 1 hour 54 minutes

EXERCISE 5.8

A. (1) 20°C (2) 35°C (3) 40°F (4) 85°F

B. (1) 5°C (2) 25°C (3) 35°C (4) 20°C (5) 95°C
(6) 110°C (7) 125°C (8) 135°C (9) 50°C (10) 75°C
(11) 110°C (12) 120°C

C. (1) 86°F (2) 113°F (3) 185°F (4) 131°F (5) 194°F
(6) 50°F (7) 68°F (8) 140°F (9) 176°F (10) 230°F

EXERCISE 5.9

(1) 95°F
(2) Jacobabad 104°F more
(3) 40°C
(4) 9°F difference
(5) 18°F difference

REVIEW EXERCISE 5

1. (i) 28648 m (ii) 4897 cm (iii) 769 mm (iv) 6758 mm

2. (i) 1 hour 4 minutes 37 seconds (ii) 1 day 13 hours 13 minutes
(iii) 8 m 51 cm 4 mm

3. (i) 44 km 577 m (ii) 1 m 27 cm 4 mm
(iii) 36 hours 43 minutes

4. (i) b (ii) b (iii) d (iv) a

5. (i) 12:35 (ii) 10:30

6. (i) 45 minutes (ii) 1 hour 5 minutes

ANSWERS

EXERCISE 6.1

(1) Rs 180	(2) Rs 528.50	(3) Rs 770	(4) Rs 60000
(5) Rs 5.5	(6) Rs 40	(7) Rs 4.50	(8) Rs 20.50
(9) Rs 12800	(10) Rs 62.78		

EXERCISE 6.2

(1) Rs 400	(2) Rs 360	(3) Rs 105	(4) $7\frac{1}{2}$
(5) Rs 48000	(6) 4680 km	(7) 21 shirts	(8) 936 passengers
(9) 1163.4 kg	(10) Rs 29880		

EXERCISE 6.3

1.	(i) F	(ii) T		
2.	(i) 1:2	(ii) 5:8	(iii) 5:21	(iv) 500:3
3.	(i) Direct	(ii) Inverse	(iii) Inverse	(iv) Direct

4. Rs 48 5. 26.25 km 6. 18 workers

7. $7\frac{1}{2}$ litres 8. 120 soldiers 9. 66 farmers

REVIEW EXERCISE 6

1. Rs 54	2. Rs 650	3. Rs 90	4. 4 days
5. Rs 120	6. 5000 papers	7. 2000 km	

EXERCISE 7.1

2.	(a) acuate angle	(b) obtuse angle	(c) right angle
	(d) reflex angle	(e) straight angle	(f) acute angle
	(g) reflex angle	(h) obtuse angle	(i) right angle

EXERCISE 7.2

1.	(i) 335°	(ii) 330°	(iii) 270°	(iv) 280°

EXERCISE 7.3

1. (i) Yes (ii) Yes (iii) No (iv) No
2. No, because they do not have common vertex
3. (i) 30° (ii) 14° (iii) 45° (iv) 52° (v) 75°
4. (i) 155° (ii) 135° (iii) 110° (iv) 82° (v) 37°
5. (i) Complementary (ii) Supplementary (iii) Supplementary
   (iv) Complementary (v) Supplementary (vi) Complementary
6. (i) 45° (ii) 90°
7. (i) No (ii) No (iii) Yes

EXERCISE 7.7

1. (i) Rhombus (ii) Kite (iii) Trapezium (iv) Kite

REVIEW EXERCISE 7

1. Right angle
2. (i) Straight angle (ii) Right angle (iii) Straight angle
4. (i) No (ii) Yes (iii) No (iv) Yes
5. Three; AEDF, BEFD, DEFC
6. Equilateral triangles ABC, FGE, GEC, ECD, AFE, BFG
   Trapeziums FEBC, FDGC, FACG, BAGE
   Parallelogram FDCB
   Rhombus EDGC, FEBG, FAEG
7. 70°

EXERCISE 8.1

A. (i) ✗ (ii) ✓ (iii) ✓ (iv) ✓ (v) ✗
   (vi) ✓ (vii) ✓ (viii) ✓ (ix) ✗

B. (1) (a) cm (b) sq. cm
   (2) (a) cm (b) sq. cm
   (3) (a) m (b) sq. m

C. (1) (a) cm (b) sq. cm (2) (a) cm (b) sq. cm
   (3) (a) cm (b) sq. cm (4) (a) cm (b) sq. cm

EXERCISE 8.2

A. (1) 7 cm (2) 100 mm (3) 80 mm

B. (1) 640000 sq. cm (2) 980100 sq. cm
(3) 592900 sq. cm (4) 1518000 sq. cm

C. (1) area = 6 sq. cm, perimeter = 10 cm
(2) area = 5 sq. cm, perimeter = 12 cm
(3) area = 12 sq. cm, perimeter = 14 cm
(4) area = 16 sq. cm, perimeter = 20 cm
(5) area = 45 sq. cm, perimeter = 28 cm
(6) area = 28 sq. cm, perimeter = 22 cm
(7) area = 9 sq. cm, perimeter = 13 cm
(8) area = 28 sq. cm, perimeter = 23 cm

D. (1) area = 16 sq. cm, perimeter = 16 cm
(2) area = 36 sq. cm, perimeter = 24 cm
(3) area = 56.25 sq. cm, perimeter = 30 cm
(4) area = 67.24 sq. cm, perimeter = 32.8 cm
(5) area = 3136 sq. mm, perimeter = 224 mm
(6) area = 8464 sq. mm, perimeter = 368 cm

E. (1) E (2) F (3) A, B, C, D and F
(4) E (5) A and D, B and E, C and F

EXERCISE 8.3

(1) 280 m perimeter (2) 49 sq. m area
(3) 240 cm long (4) Area = 5400 sq. m, perimeter = 300 m
(5) 860 cm lace (6) Area of square = 625 sq. m
(7) Area of rectangle = 600 sq. m
(8) (i) 180 sq. m (ii) 100 sq. m (iii) Floor, 80 sq. m

REVIEW EXERCISE 8

A. (1) d (2) c (3) c
(4) c (5) c (6) b

B. (1) 4 x side (2) 2 x (length + breadth)
(3) perimeter = 28 cm, area = 49 sq. cm
(4) perimeter = 26 cm, area = 40 sq. cm

ANSWERS

EXERCISE 9.1

(1) Mean = 16 (2) Mean = 4 (3) Mean = 7.875 (4) Mean = 9.625

(5) Mean = $\frac{49}{80}$ (6) Mean = $\frac{1009}{3000}$ (7) Mean = 3.85 (8) Mean = 8.33

(9) Mean = $7\frac{763}{900}$ (10) Mean = 27.66

EXERCISE 9.2

(1) Average Marks = 68.4
(2) Average Expenditure per day = Rs 19
(3) Average temperature = 40.6°C
(4) 2 paras
(5) Average score = 70
(6) Average income = Rs 634
(7) Average speed = 70 km
(8) Average speed = 47.5 km
(9) Average runs = 9
(10) Average rain fall = 8 mm

EXERCISE 9.3

2. (i) 20 millions (ii) 30 millions (iii) 35 millions
(iv) 1990 (v) 2010 (vi)

Years	1990	1995	2000	2005	2010
Population in Millions	10	15	30	35	40

3. (i) February (ii) May (iii) 55 thousands
(iv) 7 thousands (v) January and April (vi) March
(vii) 10 thousands (viii) 6 thousands

REVIEW EXERCISE 9

1. (i) Average = 5.83 (ii) Average = 30
2. 19
3. 80 runs
4. (i) 3 (ii) 5 (iii) 2 (iv) 4 (v) 8 (vi) 9
5. (i) 30 (ii) 40 (iii) 20 (iv) 60 (v) 70 (vi) 80
6. (i) 16 (ii) 31.25 (iii) Bar